Attachment no. 5 to ZW 16/2020

Attachment no. **14** to studies program

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| **FACULTY OF ARCHITECTURE**  **COURSE SYLLABUS**  Course title in Polish: **Projektowanie architektoniczne - Architektura adaptacyjna**  Course title in English: **Architectural Design - Adaptive 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**: AUA117705P**  Group of courses: **NO** |

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|  | **Lecture** | **Tutorial** | **Laboratory** | **Project** | **Seminar** |
| Number of hours of organized classes in University (ZZU) |  |  |  | **105** |  |
| Number of hours of total student workload (CNPS) |  |  |  | **225** |  |
| Form of crediting |  |  |  | **Crediting with grade** |  |
| For group of courses mark (X) final course |  |  |  |  |  |
| Number of ECTS points |  |  |  | **9** |  |
| including number of ECTS points for practical (P) classes |  |  |  | **5** |  |
| including number of ECTS points for direct teacher-student contact classes or other people conducting classes (BU) |  |  |  | **6,75** |  |

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

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| **COURSE OBJECTIVES** |
| **C1** Expanding knowledge and skills allowing to:   * notice existing or predicted environmental threats in the natural and social sphere (climate change, depletion of non-renewable energy sources, civilization diseases resulting from deterioration of air quality, migration, aging of societies, weakening of social ties, etc.), * indicate advanced architectural solutions (modification of existing or creation of new structures) aiming at minimizing the negative effects of changes in the environment.   **C2** Acquiring the ability to design multi-functional buildings based on:   * studies and environmental analyses, including those based on the available scientific literature, * principles of sustainable development and forecasts of changes in the city structure, resulting from social, economic and environmental (climatic) conditions, * structural, material, construction and infrastructure innovations aimed at improving the quality of life in the city in individual and social dimensions, * enabling conscious shaping, controlling and adjusting the climate inside buildings and their immediate vicinity, and adjusting the form of the building to the changing activities of users.   **C3** Acquaintance with complex issues of sustainable architecture and the analysis of their interdependencies: ecological footprint of materials, saving energy and other environmental resources, renewable energy sources, sustainable water management, integrated greenery and social accessibility.  **C4** Acquiring the ability to actively participate in an Integrated Design Process as an architect and a coordinator. |

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| **COURSE LEARNING OUTCOMES** |
| **Relating to knowledge:**  1.1.1) The graduate knows and understands structural, constructional and engineering problems associated with designing buildings.  1.1.2) The graduate knows and understands detailed issues in the field of architecture and urban planning related to solving complex design problem.  1.1.3) The graduate knows and understands advanced issues related to architecture and urban planning useful for designing structures in the context of social, natural, economic, legal and other non-technical conditions of engineering activities.  1.1.4) The graduate knows and understands issues related to the physics, technology and functions of buildings to the extent that ensures the comfort of their utilization and protection against atmospheric agents.  1.1.5) The graduate knows and understands relations between man and architecture and between architecture and the surrounding environment, and the necessity to adapt architecture to human needs and scale.  1.1.6) The graduate knows and understands regulations and procedures that are necessary to implement building projects and integrate buildings with the overall urban planning project.  1.1.7) The graduate knows and understands methods and measures for the implementation of ecologically responsible and sustainable design and the protection and conservation of the surrounding environment.  1.1.9) The graduate knows and understands principles, solutions, structures and building materials used in complex engineering tasks related to architectural design.  1.1.10) The graduate knows and understands 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.  1.1.12) The graduate knows and understands principles of professional presentation of architectural concepts.  1.1.13) The graduate knows and understands the nature of the architectural profession and its role in society.  A.W1. The graduate knows and understands architectural design in a complex context, public use buildings in an urban environment.  A.W4. The graduate knows and understands provisions of local land-use plans to the extent that is necessary for architectural design.  A.W5. The graduate knows and understands the principles of universal design, including the concept of designing spaces and buildings accessible to all users, and the principles of ergonomics, necessary to provide full functionality of the space and structures under design.  A.W6. The graduate knows and understands advanced methods of analysis, tools, techniques and materials necessary to develop design concepts in an interdisciplinary environment, with particular emphasis on cross-industry collaboration.  A.W8. The graduate knows and understands the interdisciplinary nature of architectural and urban design and the need to integrate knowledge from other disciplines and to apply it in the designing process in cooperation with specialists in these disciplines.  **Relating to competences:**  1.2.1) The graduate is able to use the experience acquired during studies to critically analyze the conditions and formulate conclusions for designing in a complex, interdisciplinary context.  1.2.2) The graduate is able to use interdisciplinary knowledge and skills acquired during studies to design a sophisticated architectural structure or urban complex that meets the aesthetic and technical requirements, creating and transforming space and giving it new values.  1.2.3) The graduate is able to prepare an advanced graphic, written and oral presentation of his or her original design concepts in the field of architecture.  1.2.4) The graduate is able to apply analytical methods in formulating and solving design tasks, present the theoretical background and the justification for the presented solutions in the form of a scientific study.  1.2.5) The graduate is able to organize the work including all phases of design concept development.  A.U1. The graduate is able to design a complex architectural structure, creating and transforming space so as to give it new values – in accordance with the assigned or adopted program which takes into account the requirements and needs of all users, the spatial context, and the technical and non-technical aspects.  A.U4. The graduate is able to perform a critical analysis of conditions, including the assessment of land use and development, forecast the processes of transformation of cities and predict the effects of these transformations.  A.U5. The graduate is able to evaluate the usefulness of advanced methods and tools for solving simple and complex engineering tasks that are typical in architecture, urban planning and spatial planning, and choose and apply appropriate methods and tools in designing.  A.U7. The graduate is able to perform a critical analysis and assessment of a project and its implementation with respect to the modernization and reconstruction of architectural and urban structures that have cultural values.  A.U8. The graduate is able to think and act creatively, with an understanding that designing is a complex and multi-faceted endeavor, and express his or her own artistic concepts in architectural and urban design.  A.U9. The graduate is able to integrate information obtained from various sources, interpret and critically analyze it in detail and use it to draw conclusions, as well as formulate and justify opinions and demonstrate their relationship with the designing process on the basis of available scientific achievements in the discipline.  A.U10. The graduate is able to communicate by means of various techniques and tools in a professional and interdisciplinary environment to the extent that is appropriate for architectural and urban design.  A.U11. The graduate is able to work individually and in a team, including collaborating with specialists from other industries.  A.U12. The graduate is able to estimate the time needed to complete a complex design task.  A.U13. The graduate is able to formulate new ideas and hypotheses, analyze and test novelties related to engineering and research problems in the field of architectural and urban design.  A.U14. The graduate is able to prepare architectural and construction documentation using appropriate scales and in relation to the conceptual architectural design.  A.U15. The graduate is able to implement the principles and guidelines of universal design in architecture.  **Relating to social skills:**  1.3.2) The graduate is ready to respect the diversity of views and cultures and demonstrate sensitivity to the social aspects of the profession.  1.3.3) The graduate is ready to take responsibility for social, architectural and urban planning values in the protection of the environment.  A.S1. The graduate is ready to effectively use imagination, intuition, creative attitude and independent thinking to solve complicated design problems.  A.S2. The graduate is ready to speak and make presentations in public.  A.S3. The graduate is ready to follow teamwork principles and take responsibility for joint tasks and projects.  A.S4. The graduate is ready to take responsibility for shaping the natural environment. |

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| **PROGRAMME CONTENT** | | |
| **Form of classes - project** | | **Number of hours** |
| Proj 1 | Introduction: overview of the scope of the project (multifunctional building in downtown development), the conditions of crediting, indication and a brief overview of the available literature and other sources of information.  Division into project groups (2-3 people), discussion about the work mode (the stage of freehand sketches, working models, creating computer models, final mockup). Determining the rules of cooperation in a team and preparation for work.  Allocating the main topics to project groups and additional individual topics for studies and presentations.  Workshops: development of initial assumptions for the project.  Review and discussion of the results of the work on the group forum.  Knowledge:  Concepts, legal bases. Trends in sustainability and their impact on design. Growth, development, evolution - typology of changes and systematics of design responses. Good practices in sustainable development, non-obvious solutions and idea's traps. | 7 |
| Proj 2 | Creation of a 3D model of a complex urban context surrounding the designed building. Analysis of the conditions on the 3D model: functional, spatial, natural, historical and cultural environment and landscape. Resource valorisation, design conclusions. Preparation of research documentation. Graphical preparation of analyses and inventory drawings (plans and sections) of the surroundings and the plot on a scale of 1:500-1:200.  Workshops in the field:  Comparison of analyses performed on the basis of data resources with an on-site inspection. Preparation of photographic documentation in accordance with the known research method (sketches, diagrams).  Review and discussion of the results of the work.  Knowledge:  In-depth analysis of the place; resource, valorisation, conclusions, query of archival and scientific materials regarding the location and its conditions and context. Overview of the Integrated Design Process (IDP), Post Occupancy Evaluation and Building Performance Evaluation. Climate simulations (Envi-met).  Completion of the 1st stage of work. | 7 |
| Proj 3 | Workshops (partial building concept): mobile building - adaptation to changes in user requirements. Analysis of examples from internet and literature sources, application to own concepts. Preparation of sketches, working models and multimedia presentation.  Development of the utility program diagram and establishing the standard of the target building.  Individual revisions and consultations.  Knowledge:  Definitions of adaptability, types and typology of changes in the conditions of architectural design. Conscious and effective shaping of climate parameters in a complex urban environment. Differences between sustainable architecture and its ability to climate adaptation. | 7 |
| Proj 4 | Analysis of anti-ecological architecture examples from internet and literature sources. Developing conclusions and application to own concepts. Presentations of examples and public discussion on the group forum.  Establishing the functional program of the building, first proposals for the shape, construction diagram, location of the building on the plot. Development of drawings and diagrams in various scales.  Individual revisions and consultations.  Knowledge:  Environmental parameters of buildings. Environmental conditions of architectural design described and measured in the LCA (Life Cycle Assessment) method. Determining the programming content of the architecture, creating a functional and spatial program. | 7 |
| Proj 5 | Workshops (partial building concept): "ultra low-tech" - adaptation to changes in resource availability. Analysis of examples from internet and literature sources, application to own concepts. Preparation of sketches, drawings in various scales and working models.  Preparation of a bill of quantities for the "ultra low-tech" building design. Calculation of embodied energy.  Review of works and discussion of their results.  Knowledge:  Environmental profile of materials, their eco-durability, embodied energy; joining materials and structures. Recycling of materials. | 7 |
| Proj 6 | Implementation of an aggregated concept: sketches, development of drawings, plans and cross-sections with the surroundings on a scale of  1:100 and 1:200, working mock-ups, functioning diagrams, comparison with the conclusions of analyses and checking compliance with the assumptions: functional, material, energy, microclimatic and others.  Individual revisions and consultations with the constructor.  Review and discussion of the results of the work on the group forum.  Completion of the 2nd stage of work. | 7 |
| Proj 7 | Concept of land development: determination of functional zones outside the building, indication of the distribution of basic elements of land development, topography. Development of drawings in various scales.  Preparation of a building model and its immediate surroundings in CAD / BIM / 3D.  Development of building operation patterns: adaptation of the building to changing lighting conditions (daily, and seasonal) and ventilation (shape of the surroundings).  Performing a simplified simulation of ventilation (Energy 2D) and introduction to the simulation of thermal comfort (Envi-met).  Individual revisions and consultations.  Review and discussion of the results of the work on the group forum.  Discussion of the possibility of improving the functioning and selection of solutions in the field of water management and integrated greenery. | 7 |
| Proj 8 | Updating the architectural concept of the building including computer simulations of lighting, estimation of solar gains (Shadow Analysis, DL\_DeLumine) and correction for thermal comfort (Envi-met).  Indication of ways of adapting architecture to the predicted climate changes.  Workshop with the construction engineer: concept of construction and technology selection.  Review and discussion of the results of the work in the group forum.  Designing construction details and simulating thermal bridges - computer models.  Individual revisions and consultations.  Knowledge:  Passive energy - adapting the structure of the building to the climatic conditions of the environment. Design of transparent partitions and their covers. Adaptability of passive solutions. Estimating energy losses and gains resulting from the shape of the building and its surroundings. | 7 |
| Proj 9 | Making a mock-up/ computer model of the study scope.  Preliminary evaluation of the environmental parameters of the site and building. Compilation of research in the form of a table. Completion of building performance diagrams in terms of energy management. Identification of architectural and construction solutions that enable the adaptation of individual systems to changes of the environment and user needs. Development of drawings in various scales.  Review and discussion of the results of the work on the group forum.  Knowledge:  Active energy - heat sources, ventilation systems - integration with the building, influence on architecture. Energy - consumption and acquisition in a building scale. Adaptability of active solutions. | 7 |
| Proj 10 | Modelling and simulating Renewable Energy Sources. Expected energy effects, system sizes and their integration with architecture. Energy performance of buildings and comfort of use. The concept of user comfort and various methods of its description. (Energy 3D).  Individual revisions and consultations.  Workshops with industry designers and specialists; development of the concept of HVAC equipment, energy performance, development of solutions and description in the field of fire protection of buildings (drawing and description). Preparation of drawings in various scales and multimedia presentation.  Review and discussion of the results of the work.  Completion of the 3rd stage of work. | 7 |
| Proj 11 | Workshops: partial building concept "bio (water + green)" as one of the forms of adaptation to climate change. Development of drawings in various scales and multimedia presentation.  Summary of the work to date: embodied energy, functional and spatial layout of the building and the surrounding area, building structure and details.  Knowledge:  Sustainable surroundings. BAF, nature compensation. Green and blue infrastructure in the building. Greenery on the plot and integrated with the building, selection of vegetation in terms of its impact on the surroundings. Anticipating changes in land development. Designing the building's surroundings regarding ecosystem services. | 7 |
| Proj 12 | Workshops with the participation of a landscape architect: selection of vegetation and street furniture solutions. Managing the rainwater.  Development of a water and greenery management scheme in the vicinity of the building, calculation of the size of the retention reservoir and absorptive basins as solutions adapting to the anticipated climate changes.  Review and discussion of the results of the work.  Calculations of environmental parameters (part 1).  Creating models of the building and its immediate surroundings in CAD / BIM / 3D.  Individual revisions and consultations. | 7 |
| Proj 13 | Creating models of building and its immediate surroundings (physical and in CAD / BIM / 3D). Preparation of conceptual design drawings with elements of the construction and detailed design. Collective estimation of the impact of the solutions applied on the microclimate of the surroundings and the comfort of users. Analysis and summary of architectural and construction solutions in response to changing environmental conditions. Preparation of applications in the form of drawings of various scales, diagrams and descriptions.  Project presentation proposals (layout, graphics).  Individual revisions and consultations. | 7 |
| Proj 14 | Performing calculations of the basic environmental parameters of the building and its summaries - completion and final verification. Indication of ways to monitor building changes over time.  Completion of making 1:100 scale building models. Completion of creating the building model and its immediate surroundings in CAD / BIM / 3D. Comprehensive preparation of the project and presentation. Proposals for the graphic presentation of the project - demonstration charts. Development of plans, elevations and sections in the scale 1:500 -1:100 together with the surroundings and construction details (drawings, scale 1:5 - 1:20).  Checking the projects in terms of compliance with regulations and assumptions.  Individual revisions and consultations. | 7 |
| Proj 15 | Comprehensive preparation of the project and its presentation.  Project review and public presentation and discussion. | 7 |
|  | **Total hours** | **105** |

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| **TEACHING TOOLS** |
| **N1 -** Field research.  **N2 -** Case studies.  **N3 -** Literature studies.  **N4 -** Design workshops.  **N5 -** Presentation of projects.  **N6 -** Presentations and group discussions.  **N7 -** Problem discussions.  **N8 -** Concept work.  **N9 -** Analytical work.  **N10 -** Teamwork.  **N11 -** Individual consultations.  **N12 -** Specialist consultations.  **N13 -** Group consultations.  **N14 -** Individual revisions (including consultations with experts). |

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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 | 1.1.1)  1.1.2)  1.1.3)  1.1.4)  1.1.5)  1.1.6)  1.1.7)  1.1.9)  1.1.10)  1.1.11)  1.1.12)  1.1.13)  A.W1.  A.W4.  A.W5.  A.W6.  A.W8.  1.2.1)  1.2.2)  1.2.3)  1.2.4)  1.2.5)  A.U1.  A.U4.  A.U5.  A.U7.  A.U8.  A.U9.  A.U10.  A.U11.  A.U12.  A.U13.  A.U14.  A.U15.  1.3.2)  1.3.3)  A.S1.  A.S2  A.S3.  A.S4. | Evaluation of the analytical part of the project: formal and substantive completeness of the scope of analyses, accuracy of conclusions. |
| F2 | Assessment of the building's conceptual solutions, compliance with the design assumptions and analysis conclusions, evaluation of the form of presentation and drawing correctness. |
| F3 | Evaluation of the completeness of the performance of tasks in classes and the correctness of the functioning patterns of the designed building. |
| F4 | Evaluation of innovation and feasibility of the proposed solutions that enable adaptation of the designed architecture to changes in its environment (assessment of partial concepts of the building). |
| F5 | Assessment of the final solutions of the form, function and structure of the building, compliance with the law and assumptions.  Evaluation of the form of presentation and drawing correctness. |
| **C = 20%F1 + 20%F2 + 20%F3 + 20%F4 + 20%F5** | | |

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| **BASIC AND ADDITIONAL LITERATURE** |
| **basic LITERATURE:**   1. Bać, A., *Zrównoważenie w architekturze. Od idei do realizacji na tle doświadczeń kanadyjskich,* Wrocław 2016. 2. Bott, H., Grassl, G.C., Anders, S., *Sustainable Urban Design. Vibrant Neighbourhoods, Smart Cities, Resilience,* „Detail Special”, 2019. 3. Bristow, D. N., *Thermodynamics and the Sustainability of Cities,* Toronto 2013. 4. Brundtland, G., *Report of the World Commission on Environment and Development: Our Common Future,* United Nations General Assembly document A/42/427 1987. 5. Drexler, H., El Khouli, S., *Holistic Housing. Concepts, Design Strategies and Processes,* Munich 2012. 6. Ebert, T., Eβig, N., Hauser, G., *Green Building Certification Systems. Assessing Sustainability, International System Comparison, Economic Impact of Certifications,* München 2010. 7. Farr, D., *Sustainable urbanism. Urban design with nature,* New York 2008. 8. Hall, K. B., Porterfield, G. A., *Community by design. New urbanism for suburbs and small communities,* New York 2001. 9. Hegger, M., Fuchs, M., Stark, T., Zeumer, M., *Energy manual,* Basel 2008. 10. König, H., Kohler, N., Kreiβig, J., Lützekendof, T., *A Life Cycle Approach to Buildings. Principles, Calculations, Design Tools,* München 2010. 11. Lenz, B., Schreiber, J., Stark, T., *Sustainable Building Services,* München 2011. 12. Parker, H. S., Macguire, J. W., Ambrose, J., *Simplified Site Engineering,* New York 1991. 13. *Cost-Effective Building. Economic Concepts and Constructions,* Schittich, C. (red.),Basel 2007. 14. Schmitz-Gunther, T., *Living Spaces – Ecological Building and Design,* New York 1998. 15. Sumień, T., Wegner-Sumień, A., *Ekologiczne miasta, osiedla, budynki,* Warszawa 1990. 16. Watson, D., Plattus, A., Shilbey, R., *Time Saver Standards for Urban Design,* New York 2001. 17. Arnfield, A.J., *Street Design and Urban Canyon Solar Access,* „Energy and buildings”, t.14, nr 2, 1990, s. 117-131. 18. Batty, M., *The Size, Scale, and Shape of Cities*, „Science”, t. 319, 2008, s. 769. 19. Błażejczyk, K.,Jendritzky, G., Bröde, P., Fiala, D., Havenith, G., Epstein, Y., Psikuta, A., Kampmann, B., *An Introduction to the Universal Thermal Climate index (UTCI),* „Geographia Polonica”, t.86, nr 1, 2013, s. 5-10. 20. Cebrat, K., Nowak, Ł., *Revealing the Relationships Between the Energy Parameters of Single-Family Buildings with the Use of Self-Organizing Maps*, „Energy and Buildings”, t. 178, 2018, s. 61-70. 21. Januchta-Szostak, A., *Usługi ekosystemów wodnych w miastach*, „Zrównoważony rozwój – zastosowania”, t. 3, 2012, s. 91-110. 22. Kershaw, T., *Climate Change Resilience in the Urban Environment*, „IOP Science”, 2017. 23. Rees, W., *The ecology of Sustainable Development*, „Ecologist”, t.20, nr 1, 1990, s. 18-23. 24. Sporek, J., *Szacowanie wartości krajobrazu*, „Architektura Krajobrazu”, t.1, 2001, s. 53-59. 25. Odnośne ustawy, akty prawne i normy.   **additional LITERATURE:**   1. Ausloos, M., Dirickx, M., *The Logistic Map and the Route to Chaos. From Beginings to Modern Applications*, Berlin 2006. 2. Herman, D., *Steady-State Economics*, Washington DC. 1991. 3. Meadows, D.H., Meadows, D.L., Randers, J., Behrens, III W.W., *Limits to Growth. A Report to The Club of Rome’s Project of the Predicament of Mankind*. Falls Church 1972. 4. Ojciec Święty Franciszek, *Encyklika Laudato Si’. W trosce o wspólny dom*, Warszawa 2015. 5. Popper, K. R., *W poszukiwaniu lepszego świata. Wykłady i rozprawy z trzydziestu lat*, Warszawa 1997. 6. Zumthor, P., *Myślenie architekturą*, Kraków 2010. 7. Bendoricchio, G, Jørgensen SE, *Exergy a Goal Function of Ecosystems Dynamic*, „Ecological Modelling”, t. 102, 1997, s. 5-15. 8. Bettencourt, L.M.A., Lobo, J., Helbing, D., Kuhner,t C., West, G.B., *Growth, Innovation, Scaling, and the Pace of Life in Cities,* „PNAS”,t. 104(17), 2007, s. 7301-7306. 9. 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J., Burgera, O., DeLong, J.P., Walker, R.S., Moses, M.E., Brown, J.H., *Population stability, cooperation, and the invasibility of the human species*, „PNAS”, t. 106, nr 30, 2009, s. 12255-12260. 15. Mansury, Y., Shin, J.K., *Size Connectivity and Tipping in Spatial Networks: Theory and Empirics*, „Computers, Environment and Urban Systems”, t. 54, 2015, s. 428-437. 16. Mijorski, S., Cammelli, S., Green, J., *A Hybrid Approach for the Assessment of Outdoor Thermal Comfort*, „Journal of Building Engineering”, t. 22, 2019, s. 147-153. 17. Odum, H., *Self-organization, Transformity and Information*, „Science”, t.242, 1988, s. 1132-1139. 18. Patten, B.C., *Network Integration of Ecological Extremal Principles: Exergy, Emergy, Power, Ascendency, and Indirect Effects*, „Ecological Modelling”, t.79, 1995, s. 75-84. 19. Robinson, J., *Squaring the Circle? Some Thoughts on the Idea of Sustainable Development*, „Ecological Economics”, t. 48, 2004, s. 369-384. 20. Turner, G., *A Comparison of the Limits to Growth With Thirty Years of Reality*, „Global Environmental Change”, t. 18, nr 3, 2008, s. 397-411. 21. Ulanowicz, R.E., *The Balance Between Adaptability and Adaptation*, „BioSystems”, t. 64, 2002, s.13-22. 22. Zielonko-Jung K., *Uwarunkowania energetyczne budynków tworzących ulicę miejską.* W: *Kierunki rozwoju budownictwa energooszczędnego i wykorzystania odnawialnych źródeł energii.* Anna Bać, Jacek Kasperski (red), Wrocław 2013, s. 41-51. 23. *Poradnik TEEB dla miast: usługi ekosystemów w gospodarce miejskiej*, Kraków 2011. https://sendzimir.org.pl/publikacje/poradnik-teeb-dla-miast-uslugi-ekosystemow-w-gospodarce-miejskiej/ 24. *Global Warming of 1.5 °C. An IPCC Special Report on the Impacts of Global Warming of 1.5 °C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat Of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, 2019. http://report.ipcc.ch/sr15/pdf/sr15\_spm\_final.pdf 25. *Standardy planowania i zagospodarowania ulic z uwzględnieniem zielono-niebieskiej infrastruktury*, 2020. http://uchwaly.um.wroc.pl/uchwala.aspx?numer=2785/20 26. *Wrocławskie Standardy Kształtowania Przestrzeni Miejskich Przyjaznych Pieszym*, 2017. https://www.wroclaw.pl/rozmawia/wroclaw-przyjazny-pieszym-poznaj-standardy; 27. Materiały szkoleniowe GBC, LEED, BREEM, Ecohomes i in. |

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