Syllabus of the Interdisciplinary International Summer School Effective Solutions for Sustainable Buildings in Cities

Module: Energy saving HVAC systems and the thermal comfort of the user	
Forms and number of hours of tuition:	
Short Course Description	Ability to select of the optimal HVAC system in different types of buildings. Skills to design the heating system for in a residential building taking into account the highest level of thermal comfort.
Teaching methods	Lectures, workshops, computer labs, laboratories, design of a heating system using the available software lectures, team work on a case study, study visits in companie
Module programme	1. Overview of the basic physical parameters that affect thermal comfort and indoor air quality.
	2. Presentation of different types of HVAC systems and discussion about parameters influencing their selection.
	3. Overview of the basic functions of the Audytor SET EN computer program.
	4. Entering basic data regarding the designed central heating system.
	5. Presentation of the structure of a typical underfloor radiator.
	6. Designing a default type of underfloor radiator.
	7. Determining the position of the heat source and distributors.
	8. Designing the distribution of pipes and the location of underfloor radiators.
	9. Performing hydraulic calculations.
	10. Discussion of the calculation results.
	11. Radiator testing.
	12. Worksop and a study visit in a construction company.
Assessment methods	Reports of practical and laboratory work, project, final test.
Learning outcomes	***Knowledge: knows and understands***
	1. Student knows and understands the construction, principles of operation of modern devices used in heating, ventilation and air conditioning systems.
	2. Student knows and understands selected issues in the field of detailed knowledge - necessary to understand the thermal, flow, cooling, ventilation and air conditioning processes occurring in environmental engineering.
	3. Student knows and has an in-depth understanding of the latest development trends and technologies in environmental engineering.
	Skills: is able to
	1. Student is able to properly plan research, perform it, interpret its results and draw correct conclusions on this basis
	2. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction
	Social competence: is ready to

	1. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	1. ASHRAE Handbook - HVAC Systems and Equipment (ASHRAE Handbook of Heating, Ventilating and Air-Conditioning Systems and Equipment SI). Ashrae, 2020.
	2. Krawczyk D. (red.), Sustainable buildings. Designing and management of cost-effective and eco-friendly systems. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 211 s.,ISBN 978-83-67185-29-5, 2022 DOI:10.24427/978-83-67185-29-5
	3. Krawczyk D. (red.),Sustainable Buildings. Development of Low Energy and Eco-Friendly Constructions, Oficyna Wydawnicza Politechniki Białostockiej, 235 s.,ISBN 978-83-67185-23-3, 200 s. DOI:10.24427/978-83-67185-24-0
	4. Roger Haines, Michael Myers. HVAC Systems Design Handbook. McGraw Hill; 5th edition, 2009.
	5. Carter Grayson. Basic hydronic heating components and their role in a system: Central heating structures possess a larger heating ability than a house heater. They switch the warmth the usage of water or air. Independently published, 2021.
Supplementary references	1. Roy Treloar. Master Basic Plumbing And Central Heating. Teach Yourself Books, 2017.
	2. John Sands. Underfloor Heating Systems: An Assessment Standard for Installations Paperback. BSRIA Ltd, 2001.
	3. Krawczyk D. (red.), Buildings 2020+. Energy sources. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 274 s., ISBN 978-83-65596-72-7, 2019. DOI:10.24427/978-83-65596-73-4
	4. Markiewicz-Zahorski Przemysław, "Building construction, solution & details for professionals", Polygraphy Department of the Cracow University of Technology, 2019.

Module: Sustainable materials in construction	
Short Course Description	Ability to properly design building structures, taking into account contemporary trends in construction technologies. Ability to select material solutions of the individual building envelopes using modern construction materials taking into account climatic conditions. Ability to assess the thermal quality of the building envelope. Ability to apply critical thinking for analyzing issues related to sustainable construction, selection of environmentally friendly materials and processes.
Teaching methods	Lecture, workshop
Course Programme	The course will be developed as follows:
	1. Presentation of the modern solutions, construction technologies and materials and discussion about parameters influencing their selection.
	2. Presentation of various types of structures for energy-efficient and passive single-family residential buildings.

	3. Overview of sustainability aspects in the construction sector.
	4. Overview of the basic functions of the computer program for calculating the thermal quality of building partitions. Selection of material solutions for individual partitions of a single-family building, taking into account climatic conditions.
	5. Performing calculations of the heat transfer coefficients of the individual building envelopes. Discussion and verification of the calculation results..
Assessment methods	Problematic issues, final test
Learning outcomes	***Knowledge: knows and understands***
	1. Student knows and understands rules and guidelines for the design of building structures and their elements..
	2. Student knows and understands contemporary trends in construction technologies and their impact on the architectural form of buildings.
	3. Student knows and understands influence of climatic conditions on the technical conditions of shaping the architecture of the building.
	4. Student knows and understands modern solutions and construction materials used in energy-efficient buildings.
	5. Student knows and understands the selected aspects of energy-efficient buildings design.
	Skills: is able to
	1. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction.
	2. Student is able to properly use up-to-date information on innovations in construction.
	3. Student is able to to properly select the technical conditions for designing buildings in relation to climatic conditions in order to design selected building elements of the facility.
	Social competence: is ready to
	1. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work..
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	1. Krawczyk D. (red.), Sustainable buildings. Designing and management of cost-effective and eco-friendly systems. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 211 s.,ISBN 978-83-67185-29-5, 2022 DOI:10.24427/978-83-67185-29-5
	2. Krawczyk D. (red.),Sustainable Buildings. Development of Low Energy and Eco-Friendly Constructions, Oficyna Wydawnicza Politechniki Białostockiej, 235 s.,ISBN 978-83-67185-23-3, 200 s. DOI:10.24427/978-83-67185-24-0
	3. Building 2020+: Constructions, Materials and Installations. Ed. Dorota Anna Krawczyk. Printing House of Bialystok University of Technology. Bialystok –Córdoba-Vilnius 2019.

	4. Addington, M. & Schodek, D. (2005) Smart Materials and New Technologies: For the Architecture and Design Professions. Harvard University.
	5. Grudzińska M. Ostańska A., Życzyńska A. "Low Energy and Passive Buildings". Medium. Warsaw, 2017.
	6. Markiewicz-Zahorski Przemysław, "Building construction, solution & details for professionals", Polygraphy Department of the Cracow University of Technology, 2019.
Supplementary references	1. BPIE.; Staniaszek, D.; Firląg, Sz. Financing Building Energy Performance Improvement in Poland. Status Report. 2016. Available online: http://bpie.eu/wp-content/uploads/2016/01/BPIE_Financing-building-energy-in-Poland_EN.pdf/.
Module: The use of ecological sources of heat and electricity	
Short Course Description	The ability to select optimal heat generation solutions for the heating system and the production of domestic hot water based on heat pumps and solar collectors. Overview of the photovoltaic (PV) system using photovoltaic modules. Understanding the operating parameters and characteristics of heat pumps, photovoltaic panels and solar collectors. The use of solar collectors in solar power plants.
Teaching methods	Lectures, workshops, computer labs, laboratories.
Module programme	1. Presentation of issues related to the heating system based on a heat pump, methods of controlling heat pumps, ground heat exchange and other issues related to heat pump systems.
	2. Geothermal Heat Pump Systems. Horizontal and ground heat exchangers. The compressor heat pump operation in different modes. Identify the operation of heat pump modes: cooling, heating mode. COP and SCOP.
	3. Construction and principle of operation, types, operational parameters of PV, I-V and P-V curves, efficiency of PV. Calculation of the efficiency of operation of photovoltaic panels.
	4. Selection of photovoltaic panels for the building, taking into account its location and electricity consumption characteristics. Arrangement of photovoltaic panels in building.
	5. Types of solar collectors. Theoretical foundations of the principles of operation of solar collectors. Efficiency of solar collectors. Selection of solar collectors.
	6. Presentation of the principle of operation of a solar collector, determination of the characteristic parameters of solar collectors
	7. Presentation of types of wind farms. Overview of the principle of operation of a wind farm.
	8. Determination of characteristic parameters of a solar collector.
	9. Determination of the characteristics of wind turbines.
	10. Discussion of the calculation results
Assessment methods	Reports of laboratory work, project, final test.
	Knowledge: knows and understands

Learning outcomes	1. Student knows and understands the construction, principles of operation of modern devices used in heating systems.
	2. Student knows and understands selected issues in the field of detailed knowledge - necessary to understand the thermal and flow processes occurring in environmental engineering.
	3. Student knows and has an in-depth understanding of the latest development trends and technologies in environmental engineering.
	Skills: is able to
	1. Student is able to properly plan research, perform it, interpret its results and draw correct conclusions on this basis.
	2. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction.
	3. Student is able to use scientific, popular science and industry literature, subject standards, legal acts, internet databases in English language; properly use the information obtained, as well as formulate and present opinions
	Social competence: is ready to
	1. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work.
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	1. Krawczyk D. (red.), Buildings 2020+. Energy sources. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 274 s., ISBN 978-83-65596-72-7, 2019 DOI:10.24427/978-83-65596-73-4
	2. Krawczyk D. (red.), Sustainable buildings. Designing and management of cost-effective and eco-friendly systems. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 211 s.,ISBN 978-83-67185-29-5, 2022 DOI:10.24427/978-83-67185-29-5
	3. Krawczyk D. (red.),Sustainable Buildings. Development of Low Energy and Eco-Friendly Constructions, Oficyna Wydawnicza Politechniki Białostockiej, 235 s.,ISBN 978-83-67185-23-3, 200 s. DOI:10.24427/978-83-67185-24-0
	4. Xiao, Weidong. Photovoltaic Power System. 1st ed. New York: Wiley, 2017. Web
	5. Sonnenenergie, Deutsche Gesellschaft Fur. Planning and Installing Photovoltaic Systems. London: Taylor and Francis, 2013. Planning and Installing. Web.
	6. Andrew D. Chiasson, Geothermal heat pump and heat engine systems : theory and practice. Hoboken : ASME Press ; Chichester : Wiley, 2016.
Supplementary references	1. Grassi W., Heat Pumps: Fundamentals and Applications, Springer International Publishing AG, 2017.
	2. Sathyajith M., Wind Energy Fundamentals, Resource Analysis and Economics, Springer-Verlag Berlin Heidelberg 2006
	3. Francis de Winter, Solar Collectors, Energy Storage, and Materials, The MIT Press

Module: Sustainability in buildings: what is sustainability, sustainable design process, technological solutions for sustainable buildings external envelope	
Short Course Description	The course starts outlying the main concepts related firstly to sustainability and then to sustainability in constructions detailing the sustainable integrated design process and the construction site analysis. Then the design of school sustainable buildings is analysed in detail considering every distinguishing typological factors. Finally different kind of technological solutions for the external walls are addressed: rainscreen façades, external insulated walls and glazing façades detailing all components and characteristics. A workshop during face-to-face lectures is addressed to practice the main concepts addressed during online lectures.
Teaching methods	Lectures, individual practical activities, face-to-face workshop (design of a case study).
Module programme	The course will be developed as follows:
	1. The concept of sustainability: energy consumption and GHG emissions in Europe, history of sustainability, sustainability in buildings – lecture and individual test (questionary).
	2. Construction site analysis: sustainable integrated design, site analysis, solar radiation, wind and vegetation – lecture and individual test (practical exercise).
	3. Sustainable school buildings: qualitative and quantitative guidelines to design a sustainable school, cost optimal method and advices/observations to redevelop an existing school building - lecture and individual test (game: crossword).
	4. General information on vertical closures: functions, requirements and performance, functional model and functional layers – lecture and individual test (practical exercise).
	5. External insulated walls: the ETICS: functional model, vêture, ETICS system, technological details – lecture and individual test (practical exercise).
	6. Rainscreen façades: functional model, different type of technological solutions (system components, details, examples) – lecture and individual test (practical exercise).
	7. Glazing and glass façade: functional model, technical alternatives, main components, glass characteristics, glazing configuration, details and examples – lecture and individual test (practical exercise).
	8. Sustainable building design: construction site analysis in different climate zone, functional organization of the internal layout for a school or house, verification of the different building typological factors, design of façade ad solar shading system, choice of technological solution for external wall and glazing and calculation of the environmental impact of the technological solution chosen for the external wall – workshop: students work in group from different HEI.
	9. Preparation of final reports and presentations.

Assessment methods	Final individual test (questionary, game or practical exercise) for each lecture, final presentation of the building designed by working in group during workshop.
Learning outcomes	***Knowledge: knows and understands***
	4. Student knows and understands contemporary trends in construction technologies and their impact on the architectural form of buildings.
	5. Student knows and understands influence of climatic conditions on the technical conditions of shaping the architecture of the building.
	6. Student knows and understands modern solutions and construction materials used in energy-efficient buildings.
	7. Student knows and understands selected aspects of energy-efficient buildings design.
	Skills: is able to
	1. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction.
	2. Student is able to act in an entrepreneurial way through training and improving professional competences, and initiate activities aimed at using their knowledge and skills.
	3. Student is able to be creative and entrepreneurial, cooperate and work in a group, assuming different roles in it.
	Social competence: is ready to
	1. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work.
	2. Student is ready to apply and adhere to the principles of professional ethics and conduct themselves in a professional manner while performing job duties and to enforce such behavior on others.
Student workload	Participation in classes, working on practical project, participation in student-teacher sessions related to the project.
	1. Krawczyk D. (red.), Sustainable buildings. Designing and management of cost-effective and eco-friendly systems. Białystok, Oficyna Wydawnicza Politechniki Białostockiej, 211 s.,ISBN 978-83-67185-29-5, 2022 DOI:10.24427/978-83-67185-29-5
	2. Krawczyk D. (red.),Sustainable Buildings. Development of Low Energy and Eco-Friendly Constructions, Oficyna Wydawnicza Politechniki Białostockiej, 235 s.,ISBN 978-83-67185-23-3, 200 s. DOI:10.24427/978-83-67185-24-0
	3. EN 15978 (2011): Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method
	4. ISO 21931(2010): Sustainability in building construction - Framework for methods of assessment of the environmental performance of construction works Buildings.
	5. European Assessment Document EAD 040083-00-0404 External thermal insulation composite systems (ETICS) with renderings.

	6. EN 13119:2016 - Curtain Wall - Terminology
	7. F. Bazzocchi, C. Ciacci, V. Di Naso, Qualitative and quantitative guidelines for carbon-neutral kindergarten design in Italy, in Journal of Green Buildings, fall issue, vol. 16, 2021. ISSN: 1552-6100
	8. F. Bazzocchi, C. Ciacci, V. Di Naso, Evaluation of Environmental and Economic Sustainability for the Building Envelope of Low-Carbon Schools, in Sustainability, vol. 13, 2021. ISSN: 2071-1050
Supplementary references	1. ISO 21931(2010): Sustainability in building construction - Framework for methods of assessment of the environmental performance of construction works Buildings.
	2. https://www.baubook.info/Download/e2s/OI3_Berechnungsleitfaden_V3_en.pdf?20210322172819
	3. https://calumenlive.com/it/configure
	4. https://www.agc-yourglass.com/configurator/app/login
	5. https://www.baubook.at/eco2soft/?SW=27&lng=2

Module: Heritage and modern systems in city landscape (cityscape)	
Short Course Description	The course begins with a discussion of the main concepts relating to the value of the cultural landscape - heritage in the urban landscape, its importance to the development of the city and the preservation of its identity. Reference to the Vitruvian Triad and sustainable development in heritage conservation. Discussion on the basis of examples of small historical and contemporary architectural objects in the urban landscape that have an impact on the functional, sustainable development of cities that respect the cultural landscape (e.g. fountains in Madrid, bus stops in Krumbach).

	The face-to-face workshop is designed to practise the main concepts discussed in the online lectures.
Teaching methods	Lectures, workshops, computer labs.
Module programme	1. Presentation of issues related to the value of the cultural landscape
	2. Discussion of the heritage importance to the development of the city and the preservation of its identity.
	3. Round table discussion- Reference to the Vitruvian Triad and sustainable development in heritage conservation.
	4. Presentation of the historical and modern impemetation of the cities cultural landscape (e.g. fountains in Madrid, bus stops in Krumbach).
	5. Discussion on the basis of examples of small historical and contemporary architectural objects in the urban landscape that have an impact on the functional, sustainable development of cities that respect the cultural landscape
	6. Team work on cultural and heritage conditions of green bus stop location and conclussion presentation

	7. Discussion of the teams results
Assessment methods	Reports of laboratory work, project, final test.
Learning outcomes	***Knowledge: knows and understands***
	5. Student knows and understands influence of heritage value of shaping the architecture of the building
	6. Student knows and understands contemporary trends in construction technologies and their impact on the architectural form of buildings.
	7. Student knows and understands influence of climatic conditions on the technical conditions of shaping the architecture of the building and selected aspects of energy-efficient buildings design.
	Skills: is able to
	1. Student is able to properly plan research, perform it, interpret its results and draw correct conclusions on this basis.
	2. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction in the context of heritage values.
	3. Student is able to properly select and use learned methods and tools, including advanced information and communication techniques (ICT) when solving complex problems occurring in engineering and propose their improvement or alternative solutions inspired by vernacular constructions
	4. Student is able to use scientific, popular science and industry literature, subject standards, legal acts, internet databases in English language; properly use the information obtained, as well as formulate and present opinions
	Social competence: is ready to
	1. Student is ready to use knowledge to shape the environmental awareness of society, professional and ethical, and take responsibility for their activities

	2. Student is ready to formulate and communicate to the public, in a commonly understood way, information and opinions concerning scientific achievements as well as other aspects of the engineer's activities, presenting different points of view
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	1. Krawczyk, D. (2019). *Buildings 2020+ : Constructions, materials and installations*. Oficyna Wydawnicza Politechniki Białostockiej. https://doi.org/10.24427/978-83-65596-71-0
	2. Flórez de la Colina, M. A., Izquierdo Gracia, P. C., & Gawryluk, D. (2022). *Urban public spaces: Madrid, Bialystok, Klaipeda. A guide to their functions and meaning*. Wydawnictwo Ekonomia i Środowisko
	3. Gawryluk, D., & Krawczyk, D. (2022). *Future of the city (wydanie II uzupełnione)*. Oficyna Wydawnicza Politechniki Białostockiej. https://doi.org/10.24427/978-83-67185-27-1
	4. Gawryluk, D., & Krawczyk, D. (2024). Energy production in the cityscape. W C. Gonzalvo Salas & M. J. Capomaggi Sequenzia (Red.), *Renewable borders* (s. 40–43). University of Girona.

Supplementary references	1. Jeleński, T. (Ed) (2022). *Renovation and retrofitting of old buildings in times of climate crisis*, Sendzimir Foundation, Croatia Green Building Council, Renovation and retrofitting of old buildings in times of climate crisis
	2. Renovation and retrofitting of old buildings in times of climate crisis
	3. Results – Glocal – innovative training of future engineers
Module: Ecosystem services, urban greenery, blue-green infrastructure	
Short Course Description	The course begins with a presentation of the main concepts relating to the ecosystem services in the context of the contemporaray city problems. Discussion on the basis of examples presented by students. Blue-green infrastructurea and urban greenery as solving solutions of the contemporaray cities issues related to the climate changes. Discussion on the visited during cite visits and copleted by students. The face-to-face workshop is designed to practise the main concepts discussed in the online lectures.
Teaching methods	Lectures, workshops, computer labs, laboratories.
Module programme	1. Presentation of issues related to the ecosystem servises in the context of the contemporary city problems.
	2. Discussion of the ecosystem services noticed by the students.
	3. Presentation of the urban greenery solutions as answer for contemporary city problems. Presentation of the guid of greenery dedicated for urban area.
	4. Round table discussion - urban greenery solutions on the examples chosen by the students
	5. Blue – green infrastructure - Construction and principle of operation, types
	6. Round table discussion - chosen exeples of blue-green infrastructure
	7. Team work on blue-green solutions of green bus stop location and conclussion presentation
	8. Discussion of the teams results
Assessment methods	presentation, project, final test.
Learning outcomes	***Knowledge: knows and understands***
	8. Student knows and understands the Influence of greenery ecosystem services in the city, solutions of blue-green infrastructure and types of urban greenery
	9. Student knows and understands contemporary trends in construction technologies and their impact on the architectural form of buildings.
	10. influence of climatic conditions on the technical conditions of shaping the architecture of the building and selected aspects of energy-efficient buildings design.
	Skills: is able to
	5. Student is able to properly plan research, perform it, interpret its results and draw correct conclusions on this basis.

	6. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction in the context of heritage values.
	7. properly select and use learned methods and tools, including advanced information and communication techniques (ICT) when solving complex problems occurring in engineering and propose their improvement or alternative solutions inspired by vernacular constructions
	8. Student is able to use scientific, popular science and industry literature, subject standards, legal acts, internet databases in English language; properly use the information obtained, as well as formulate and present opinions
	Social competence: is ready to
	3. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work.
	4. Student is ready to formulate and communicate to the public, in a commonly understood way, information and opinions concerning scientific achievements as well as other aspects of the engineer's activities, presenting different points of view
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	5. Krawczyk, D. (2019). *Buildings 2020+ : Constructions, materials and installations*. Oficyna Wydawnicza Politechniki Białostockiej. https://doi.org/10.24427/978-83-65596-71-0
	6. Flórez de la Colina, M. A., Izquierdo Gracia, P. C., & Gawryluk, D. (2022). *Urban public spaces: Madrid, Bialystok, Klaipeda. A guide to their functions and meaning*. Wydawnictwo Ekonomia i Środowisko
	7. Gawryluk, D., & Krawczyk, D. (2022). *Future of the city (wydanie II uzupełnione)*. Oficyna Wydawnicza Politechniki Białostockiej. https://doi.org/10.24427/978-83-67185-27-1

	8. Gawryluk, D., & Krawczyk, D. (2024). Energy production in the cityscape. W C. Gonzalvo Salas & M. J. Capomaggi Sequenzia (Red.), *Renewable borders* (s. 40–43). University of Girona.
Supplementary references	4. EFUF 2023 Book of Abstracts
	5. Bergier, T. (Ed.), Kowalewska, A. (Ed) (2019*). Addressing climate change in cities. Catalogue of urban nature-based solution*, Ecologic Institute and Sendzimir Foundaition Catalogue of urban nature-based solutions - Sendzimir Foundation
	6. Results – Glocal – innovative training of future engineers
	7. Growing Green Guide, a guide to green roofs, walls and facades
	8. https://efb-greenroof.eu/
Module: Urban public area accesability and safety	

Short Course Description	Taking into account the needs of people with different disabilities. The ability to select optimal solutions for making public urban spaces accessible to people with different needs. Practical training in identifying the needs of people with different disabilities and recognising elements in buildings and public spaces that are barriers for them. The ability to select optimal solutions for making public urban spaces safety (especially with using green solutions). Discussion on the basis of examples presented by students. The face-to-face workshop is designed to practise the main concepts discussed in the online lectures.
Teaching methods	Lectures, workshops, computer labs, laboratories.
Module programme	1. Discussion of the identifying the needs of people with different disabilities noticed by the students (workshop)
	2. Presentation of the urban public area solutions dedicated for people with different needs.
	3. Accessibility of urban public area - Construction and principle of operation, types
	4. Round table discussion - chosen exeples of accessibility solutions
	5. Presentation - chosen exeples of urban space safety solutions
	6. Round table discussion - chosen exeples of safety solutions
	7. Team work on accessibility and safety solutions of green bus stop location and conclussion presentation
	8. Discussion of the teams results
Assessment methods	Reports of laboratory work, project, final test.
Learning outcomes	***Knowledge: knows and understands***
	11. Student knows and understands standards, rules and guidelines for the design of accessibility and safety of urban public space.
	12. Student knows and understands contemporary trends in construction technologies and their impact on the architectural form of buildings.
	13. Student knows and understands the influence of greenery ecosystem services in the city, solutions of blue-green infrastructure and types of urban greenery
	Skills: is able to
	9. Student is able to properly plan research, perform it, interpret its results and draw correct conclusions on this basis.
	10. Student is able to use acquired knowledge for critical analysis, synthesis, creative interpretation and presentation of issues in the field of environmental engineering and modern construction in the context of heritage values.
	11. properly select and use learned methods and tools, including advanced information and communication techniques (ICT) when solving complex problems occurring in engineering and propose their improvement or alternative solutions inspired by vernacular constructions

	12. Student is able to use scientific, popular science and industry literature, subject standards, legal acts, internet databases in English language; properly use the information obtained, as well as formulate and present opinions
	13. Student is able to establish positive cross-cultural relationships, analyze values, norms and behaviors, and adapt their behavior to the cultural context
	Social competence: is ready to
	5. Student is ready to analyze the content obtained from various sources, as well as to critically evaluate it and use it in professional work.
	6. Student is ready to use knowledge to shape the environmental awareness of society, professional and ethical, and take responsibility for their activities
Student workload	Participation in classes, working on projects, participation in student-teacher sessions related to the project.
Basic references	1. Results – Glocal – innovative training of future engineers
	2. Flórez de la Colina, M. A., Izquierdo Gracia, P. C., & Gawryluk, D. (2022). *Urban public spaces: Madrid, Bialystok, Klaipeda. A guide to their functions and meaning*. Wydawnictwo Ekonomia i Środowisko
	3. Gawryluk, D., & Krawczyk, D. (2022). *Future of the city (wydanie II uzupełnione)*. Oficyna Wydawnicza Politechniki Białostockiej. https://doi.org/10.24427/978-83-67185-27-1
	4. Gawryluk, D., & Krawczyk, D. (2024). Energy production in the cityscape. W C. Gonzalvo Salas & M. J. Capomaggi Sequenzia (Red.), *Renewable borders* (s. 40–43). University of Girona.
Supplementary references	5. Rawski, K. L. (2024), Projektowanie uniwersalne w kontekście kształtowania dostępności obiektów architektury krajobrazu. Oficyna Wydawnicza Politechniki Białostockiej Publikacje 2024 – Oficyna Wydawnicza
	6. Kłopotowski, M. (2022). *Podlasie na wyciągnięcie ręki - przewodnik turystyczny dla osób niewidomych i słabowidzących. T. 1.* And T. 2 Fundacja Szansa dla Niewidomych.
	7. Kłopotowska, A., & Kłopotowski, M. (2018). *Dotykowe modele architektoniczne w przestrzeniach polskich miast. Cz. 1, Standardy*.Oficyna Wydawnicza Politechniki Białostockiej. Publikacje 2018 -Oficyna Wydawnicza