



Subject card

Subject name and code	Building Automation, PG_00047616						
Field of study	Automatic Control, Cybernetics and Robotics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2026/2027		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Kaczmarek					
	Teachers	dr inż. Piotr Kaczmarek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		4.0		36.0	100
Subject objectives	Introduction to building management systems: heating, ventilation, air conditioning and access control.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K03] is ready to meet social obligations, co-organise activities for the social environment, initiate actions for the public interest, think and act in an entrepreneurial way	Student is able to design automation systems that minimize building energy consumption			[SK5] Assessment of ability to solve problems that arise in practice		
	[K6_K01] is ready to cultivate and disseminate models of proper behaviour in and outside the work environment; make independent decisions; critically evaluate actions of their own, teams they lead and organisations they are part of; take responsibility for results of these actions; responsibly perform professional roles, including:n - observing rules of professional ethics and require it from others,n - care for the achievements and traditions of the profession	Student can use the literature in the field of buildings systems			[SU1] Assessment of task fulfilment		
[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student can use the documentation in the field of buildings systems - also in English			[SK5] Assessment of ability to solve problems that arise in practice			

Subject contents	1. Building as a dynamic system 2. Standards concerning building systems 3. Economical aspects of building control systems 4. Building power consumption 5. Introduction to air conditioning systems 6. Air heating process 7. Air cooling process 8. Air humidifying process 9. Air drying process 10. Heat recovery process 11. Water heaters 12. Water heater fluid flow control 13. Water heater anti-freeze protection 14. Direct exp. coolers 15. Refrigeration unit control 16. Cross flow heat exchangers 17. Rotary heat exchangers 18. Mixing chambers 19. Heat recovery control 20. Heat recovery anti-freeze protection 21. Steam humidifiers 22. Air humidifying and drying process control 23. Air flow and pressure control 24. Sensor selection for air conditioning systems 25. Actuator selection for air conditioning systems 26. Air quality control 27. Cascade temperature control 28. Air conditioning system as MIMO plant 29. Controllers dedicated for air conditioning systems review 30. Air conditioning control systems examples 31. Przykłady realizacji systemów automatyki dla potrzeb klimatyzacji i wentylacji mechanicznej w domach jednorodzinnych 32. Central heating systems 33. Heat sources in heating systems 34. Thermal center control 35. Boiler control 36. Central and decentralized temperature control 37. Sensor and actuator control in heating systems 38. Natural power sources in heating systems 39. Controllers dedicated for heating systems review 40. Heating systems examples 41. Anti-intrusion systems 42. Sensor selection in anti-intrusion systems 43. Anti-intrusion controller functions 44. Anti-fire systems 45. Sensors for anti-fire systems 46. Building system integration advantages 47. Open communication protocols in building management systems 48. EIB and LONWORKS as examples of open protocol systems 49. EIB information media 50. EIB system topology											
Prerequisites and co-requisites	No requirements											
Assessment methods and criteria	<table border="1" data-bbox="448 595 1493 701"> <thead> <tr> <th data-bbox="448 595 794 633">Subject passing criteria</th> <th data-bbox="794 595 1141 633">Passing threshold</th> <th data-bbox="1141 595 1493 633">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 633 794 663">Practical exercise</td> <td data-bbox="794 633 1141 663">55.0%</td> <td data-bbox="1141 633 1493 663">50.0%</td> </tr> <tr> <td data-bbox="448 663 794 701">Written exam</td> <td data-bbox="794 663 1141 701">55.0%</td> <td data-bbox="1141 663 1493 701">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical exercise	55.0%	50.0%	Written exam	55.0%	50.0%
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Recommended reading	<table border="1" data-bbox="448 707 1493 940"> <tr> <td data-bbox="448 707 794 869">Basic literature</td> <td colspan="2" data-bbox="794 707 1493 869"> A. Szkarowski, L. Łatowski, "Ciepłownictwo", Warszawa 2008 J. I. Levenhagen, "HVAC control system design diagrams", 1999 </td> </tr> <tr> <td data-bbox="448 869 794 898">Supplementary literature</td> <td colspan="2" data-bbox="794 869 1493 898">No requirements</td> </tr> <tr> <td data-bbox="448 898 794 940">eResources addresses</td> <td colspan="2" data-bbox="794 898 1493 940">Adresy na platformie eNauczanie:</td> </tr> </table>			Basic literature	A. Szkarowski, L. Łatowski, "Ciepłownictwo", Warszawa 2008 J. I. Levenhagen, "HVAC control system design diagrams", 1999		Supplementary literature	No requirements		eResources addresses	Adresy na platformie eNauczanie:	
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Example issues/ example questions/ tasks being completed												
Work placement	Not applicable											