GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Information Visualization, PG_00047880		
Field of study	Informatics		
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	5	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Intelligent Interactive Systems -> Faculty of Electronics, Telecommunications and Informatics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Jacek Lebiedź	
	Teachers	dr inż. Jacek Lebiedź	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	0.0	30

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	30	6.0	14.0	50

Subject objectives

The purpose of the course is to familiarize students with the methods of information visualization.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W04] knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student knows how to solve basic problems related to information visualization, knows and understands the principles, methods and techniques of information visualization and the principles of its correct design.	[SW1] Assessment of factual knowledge
[K6_W03] knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	Student defines the basic concepts of information visualization, knows the problems of information visualization and the principles of perception and acquisition of multimedia data.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>1. Rules of credit for a course, bibliography 2. Concept of visualization, data visualization, scientific visualization 3. Examples of data visualization and scientific visualization 4. Historical examples of successful visualization: Playfair’s charts, Minard’s map, Nightingale’s diagram, Snow’s map 5. Present examples of successful visualization 6. Examples of unsuccessful (incorrect) visualization 7. Data visualization – different types of data: discrete and continuous, one-dimensional, two-dimensional and multidimensional 8. Graphical forms dedicated to different categories of relationships according to types and dimensionality of domain and range 9. Standard types of graphical forms in data visualization: kinds of charts and maps 10. Exquisite methods of data visualization: percentile plot, Tukey box plot, box-percentile plot 11. Histogram, scatterplot, scatterplot matrix, “flooding” 12. Parallel coordinate plot, mosaic plot, star plot, hyperbox, multidimensional icons, Chernoff faces, stick figures 13. Enhancement of visualization – rearrangement of data 14. Examples of rearrangement of data: table lens, mosaic plot 15. Landscape presentation of data, selective manipulation 16. Scientific visualization – static and dynamic visualization, visualization of time, visualization other parameters by means of time 17. Standard types of graphical forms in scientific visualization: tree diagrams, graph diagrams, network diagrams, flowcharts 18. Specific types of graphical forms in scientific visualization: engineering drawings, exploded views, underground maps, etc. 19. Scientific visualization in computer science – visual programming 20. Graphical forms dedicated to software engineering (class diagrams, object diagrams, use case diagrams, etc.) 21. Visual tools in software engineering 22. Visualization of sequential and parallel algorithms and processes 23. Example of algorithm visualization: Huffman coding 24. Document visualization, queries in visualization, visualization of queries 25. Visualization in human-computer interaction – graphical user interface, icons, visual metaphors 26. History of evolution of graphical user interface 27. Visual interface design – rules 28. Scientific visualization in exact sciences (i.e. mathematics, physics, astronomy) – examples 29. Scientific visualization in nature sciences (i.e. chemistry, biology, medicine) – examples 30. Scientific visualization in social sciences (i.e. history, economics, sociology) – examples 31. Visual perception, anatomy of the human eye – retina and photoreceptor cells (rods and cones) 32. Color perception – trichromacy theory, metamerism, color models 33. Stereopsis, persistence of vision 34. Applications of color in visualization 35. Attracting of visual attention, useful field of view 36. Texture in visualization – Gabor model 37. Traps of visualization: optical illusions – reasons of their existence 38. Examples of physiological optical illusions 39. Examples of cognitive optical illusions 40. Discrete images: image sampling – aliasing and antialiasing 41. Color quantization – gamma correction, halftone approximation, dithering, error diffusion 42. Scalar quantization – Max-Lloyd algorithm 43. Vector quantization – simple methods: uniform algorithm, popularity algorithm 44. Methods of vector quantization: K means (LBG) algorithm, hierarchical clustering 45. Other methods of vector quantization: median cut algorithm, quantization by means of octree, agglomerative clustering</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>No requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Midterm colloquium</td><td>53.0%</td><td>50.0%</td></tr>
<tr><td>Project</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Spence, R.: Information Visualization - Design for Interaction (2nd Edition), Pearson Education, 2006. 2. Ware C.: Information Visualization, Third Edition: Perception for Design (Interactive Technologies). Morgan Kaufmann 2012.</td></tr>
<tr><td>Supplementary literature</td><td>1. Foley J. D., van Dam A., Feiner S. K., Hughes J. F.: Wprowadzenie do grafiki komputerowej. WNT, Warszawa 1995. 2. Foley J. D., van Dam A., Feiner S. K., Hughes J. F.: Computer Graphics: Principles and Practice, Second Edition. Addison-Wesley, Reading 1990. 3. Zabrodzki J. (red.): Grafika komputerowa, metody i narzędzia. WNT, Warszawa 1994.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Design and visualization of a car rim or steering wheel for a yacht using the SolidWorks software</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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