1. Basic information Course name in English:	**Narrative Scientific Visualization** (truly for everyone)	
Course name in Polish:	**Narracyjna wizualizacja naukowa** (naprawdę dla każdego)	
Number of hours:	30	
Type of course:	Elective course	
Form of course:	mixed format (lecture / seminar / laboratory) (wykład, seminarium i laboratorium)	
Code of course:		
Course leader:	dr hab. inż. arch. Marta Rusnak , prof. PWr	
Faculty of the course leader:	W1 Faculty of Architecture	
Email address of the course leader:	marta.rusnak@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):		
Architecture and urban planning		☒
Automation, electronic, electrical engineering and space technologies		☒
Information and communication technology		☒
Biomedical engineering		☒
Chemical engineering		☒
Civil engineering, geodesy and transport		☒
Materials engineering		☒
Mechanical engineering		☒
Environmental engineering, mining, and energy		☒
Mathematics		☒
Chemical sciences		☒
Physical sciences		☒
Management and quality studies		☒

2. Objectives

The course aims to familiarize PhD students with the fundamental issues influencing the process of visual communication in concise graphic forms. In addition to theoretical knowledge, doctoral candidates will acquire practical skills that will enable them to continuously refine how they communicate their research achievements through illustrations.

Particular emphasis will be placed on **narrativity**. Participants should be able to design their illustrations in such a way that the intended message is interpreted as planned. For this reason, the course is titled *Directing Scientific Graphics* rather than *Graphic Composition* or *Graphic Techniques*.

An appropriate design of graphics enables their proper and effective integration with other elements of communication—both verbal (e.g., conferences, lectures) and written (e.g., grant proposals, posters, articles). By employing **eye-tracking techniques**, doctoral candidates will be in carefully designing graphic communication bring the intended effects.

The course will combine lecture-style components with workshops, during which doctoral candidates will develop, refine, and test their own graphics created for scientific articles, posters, and presentation slides.

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of hours	Form of classes
1	Introduction What is the “direction” of scientific graphics? Do the means of graphic expression in scientific communication differ from those used by artists? Representation, pictogram, and abstraction. Narrativity in comics and advertising. The use of AI in creating scientific graphics. How to constructively critique graphics?	4	Lecture Semminar
2	The context of graphic expression and its form What is eye-tracking and how does it work? **Experiment 1** (graphic of choice – “raw”) Individual discussion of the experiment	4	Lecture Laboratory classes
3	Clarity in scientific communication How to eliminate visual distractors. Work on Graphic 2 – (charts, graphs) **Experiment 2.** Group discussion and conclusions after the second series of experiments with Graphic 2.	4	Lecture Laboratory classes Seminar
4	Narrativity and hierarchy in graphics Location, size, and relations between elements. The role of typography. The best graphics in my discipline – PhD students’ presentations.	4	Lecture Seminar
5	The sense of vision The impact of afterimage, glare, visual impairment, and color vision deficiency on the form of graphic communication. Color scales in graphics. Work on Graphic Type 3 (ideograms, graphic abstracts, procedures) **Experiment 3.** Individual discussion of the results.	4	Lecture Laboratory classes
6	Scientific graphics – where to look for inspiration? Directions for self-improvement The role of rhythm and animation in scientific presentation. Consistency in graphic and verbal narration. Individual work with a presentation (3–4 slides).	4	Lecture Laboratory classes

7	Short presentations (each student: 3 minutes – 3-4 slides). Discussion	4	Seminar
8	How to study the effectiveness of "directing scientific graphics" without an eye tracker? Self-evaluation and discussion	2	Seminar

4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

The student has a set of scientific graphics (including: chart/diagram, ideogram/procedure, PowerPoint presentation, poster, graphic abstract) in an editable form, which they will be able to work on during the course. This means that the student is either the author, a co-author, or has obtained permission from the authors to use the materials.

The PhD student is able to use any software for presentation editing and basic graphic editing. They are required to bring to class a laptop or tablet with the software they normally use to prepare their scientific graphics.

For the workshop sessions, students are required to bring A4 sheets of paper, a pencil or marker, and their preferred tools for marking color (such as felt-tip pens, highlighters, or colored pencils).

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	**Learning outcome**	
KNOWLEDGE. Doctoral student knows and understands:		
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	☐
SzD_W4	research methodology;	☐
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	☒
SzD_W6	the fundamental dilemmas of modern civilization;	☒
SzD_W7	the legal and ethical conditions of scientific activity;	☒
SzD_W8	the economic and other relevant conditions of scientific activity;	☐
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	☒
SKILLS. Doctoral student is able to:		
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively, - draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development;	☒

	transfer the results of scientific activities to the economic and social spheres;	
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☒
SzD_U4	disseminate research results, including in popular forms;	☒
SzD_U5	initiate debates and participate in a scientific discourse;	☒
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	☒
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	☐
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☒
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☒
SOCIAL COMPETENCES. Doctoral student is ready to:		
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	☒
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	☒

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

Evaluation based on activity and participation in didactic discussions during classes. Each participant prepares their own materials and refines them. The assessment also takes into account the effectiveness of predicting the gaze path of observers viewing their graphic, as recorded by the eye tracker.

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc. 4

Lecture, PowerPoint presentation, Eye-tracking experiments, Didactic discussion, Cooperation, Sketching

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

[1] Perra, M., and T. Brinkman. (2021). Seeing science: using graphics to communicate research. *Ecosphere* 12(10):

[2] Christiansen, J. (2023). Building science graphics: an illustrated guide to communicating science through diagrams and visualizations.

Khoury, C.K., Kisel, Y., Kantar, M. et al. Science–graphic art partnerships to increase research impact. *Commun Biol* 2, 295 (2019).

[3] Crameri, F., Shephard, G.E. & Heron, P.J. (2020) The misuse of colour in science communication. *Nature Communications* 11, 5444.

[4] Marta A. Rusnak, Joanna Majczyk (2025) .Eyes on city heritage enhancing consultations with accessible eye-tracking data visualization. *ACM Journal on Computing and Cultural Heritage*, s. 1-23.

[5] Duchowski, A.T. (2007). *Eye tracking methodology: Theory and practice*. Springer-Verlag, London.