Appendix No. 2. List of courses with descriptions, learning outcomes, and methods of their verification.

Lp.	Course	Type of classes	Educational objectives and content	Teaching methods and techniques	Learning outcomes	Methods of learning outcomes verification
1	**Conceptual framework of physical culture sciences**	W	The aim of the course is to familiarize doctoral students with the fundamental terms used in physical culture sciences to describe relevant issues, define their meaning, and identify their practical implications. The course also aims to enhance skills in text analysis, drawing conclusions, and freely formulating and expressing thoughts on topics related to physical culture. **Course content:** Through lectures and discussions, the following concepts will be covered: physical culture, physical culture sciences, health sciences, physical education, sport, physiotherapy, physical recreation, tourism, physical activity, measurement of physical activity, human motor skills, motor abilities, physical fitness, measurement of physical fitness, and physical fitness standards.	lecture, presentation, explanation, brainstorming	KSD_W02, KSD_U02, KSD_K02, KSD_K03	Written credit – tests (multiple-choice and open-ended questions), written statement Credit based on active participation – involvement in discussion, critical analysis of scientific content
2	**Philosophy of ethics and science**	W	The aim of the course is to familiarize students with various metaphysical assumptions adopted within the philosophy of science. It includes defining the fundamental concepts of the philosophy of science used to analyze the process of generating scientific knowledge, as well as exploring contemporary philosophical approaches aimed at increasing the credibility of scientific inquiry. The course covers the	lecture + media presentation, analysis of texts in the field of the philosophy of science, discussions on epistemological issues related to	KSD_W01, KSD_W03, KSD_U02, KSD_U07, KSD_K01, KSD_K07	Preparation of an essay on the topic: *"The problem of one's own research in the perspective of selected claims from the philosophy of science (or ethics of science)"* – 5–10 pages (10,000–

			specific nature of research in the fields of physical-biological and socio-humanistic sciences, as well as interdisciplinary studies. It introduces ethical issues arising from the processes of creating, disseminating, and applying scientific knowledge in various areas of practice. Students will develop skills in philosophical analysis of scientific texts and gain the ability to contextualize their own research topics (within the field of physical culture sciences) in the broader framework of the philosophy of science. The course also emphasizes principles of ethical creation and use of scientific knowledge. **Course content:** The origin, types, and development of scientific knowledge – a philosophical and historical analysis. Conditions and processes of scientific cognition – discovery, justification, and verification of knowledge. Methodological orientations in 20th-century science; the status of research hypotheses. Specific features of scientific cognition: research procedures, formulation of knowledge, and its properties. Research attitudes and types of scientific work; scientific schools. Ethical desiderata in science – examples. The reputation of science and the authority of scientists in light of civilizational change. The regulatory function of scientific knowledge in relation to social practices. Psychology of science as support for the philosophy and ethics of science.	ongoing research projects		20,000 characters) Discussion/defense of the theses presented in the essay

3	**Methodology of scientific work**	W	The main aim of the course is for the doctoral student to acquire the knowledge and skills necessary for effectively planning and conducting empirical scientific research in the field of physical culture sciences. **Course content:** Characteristics of scientific knowledge. The place of physical culture sciences within the classification of sciences. Stages of the research process. Characteristics and classification of research problems and hypotheses. Research problems and hypotheses in physical culture sciences. The concept and classification of variables and indicators. Characteristics of research models in physical culture sciences – correlational research, experimental model, and ex post facto model. Principles of hypothesis formulation and verification in the Fisher and Neyman-Pearson approaches (statistical hypothesis vs. research hypothesis, α, p, Type I and II error, effect size, test power). Sampling in research – types of sampling, sample size (G*Power software). Planning and developing a research project in the field of physical culture sciences. Practical guidelines for writing a scientific article.	Presentation, explanation, brainstorming	KSD_W01, KSD_W02, KSD_U01, KSD_U02, KSD_U03, KSD_K01	Oral credit (1st semester), written and oral credit (2nd semester).
4	**Statistical methods in scientific research**	ĆW	The main aim of the course is for the doctoral student to acquire knowledge and skills in statistics that enable effective data analysis using the Statistica software in the field of physical culture sciences. **Course content:** Descriptive statistics. Introduction to the Statistica software. Criteria for selecting a	Presentation, workshops – task execution in the Statistica software, explanation, brainstorming	KSD_W04, KSD_U02, KSD_U03, KSD_K05	Practical credit – execution of tasks in the Statistica software along with their discussion.

			statistical test. Parametric significance tests for independent and dependent data. Non-parametric significance tests for independent and dependent data. Measures of association strength between variables. Simple linear regression analysis. Multiple regression analysis (including stepwise predictor selection and analysis of data from correlational studies). Two-way analysis of variance (for independent and dependent data, including analysis of data from experimental research).			
5	**Formal aspects of conducting scientific research –** *Information day*	ĆW	The course covers the completion of formal requirements related to admission to the doctoral student body at the University School of Physical Education in Poznań, as well as familiarization with the organization and functioning of the Doctoral School. As part of the course, doctoral students participate in a meeting with the Vice-Rector for Science, the Director of the Doctoral School, the Chair of the Doctoral Student Council, and a representative of the library. Organizational matters, training regulations, and available scientific resources are discussed. The program also includes a tour of the university's laboratories, providing insight into the research infrastructure and opportunities for conducting research in various scientific areas.	lecture, multimedia presentation, explanation	KSD_W01, KSD_K06	Credit based on attendance.
6	**Formal aspects of conducting scientific research –** *Using literature databases*	ĆW	The aim of the course is to develop skills in reviewing, searching for, and retrieving specialist scientific literature. **Course content:** Overview of scientific literature databases available at the University. Overview of	lecture, multimedia presentation, explanation, analysis of literature databases and the ability to search for	KSD_W01, KSD_W02, KSD_U01, KSD_U02, KSD_K01	Credit based on activity – group work, participation in a discussion on the use of literature databases and the retrieval of scientific

			publicly accessible scientific literature databases. Using literature databases and the ability to efficiently narrow down/filter their content according to research interests. Retrieving relevant scientific materials (scientific articles, textbook chapters, monographs, and study guides). Accessing the above-mentioned materials using publicly available platforms and communication tools for researchers.	relevant content, creating accounts or profiles in university and publicly accessible databases		materials (scientific articles, textbook chapters, monographs, and study guides). Practical observation – assessment of the ability to navigate literature databases. Evaluation of prepared projects and presentations – presentation of key scientific articles based on literature databases within the preferred research area.
7	**Formal aspects of conducting scientific research –** *Application to the bioethics committee*	ĆW	The aim of the course is to develop the ability to independently write an application to the bioethics committee. **Course content:** Principles of conducting scientific research involving human participants in light of the Declaration of Helsinki. Principles of conducting scientific research involving animals in accordance with the requirements of the National Ethical Committee for Animal Experimentation. Types of experiments. Overview of the current procedures for submitting applications to the local bioethics/ethics committee, required documentation, and practical completion of the application. Insurance process for study participants and the research team.	lecture, multimedia presentation, explanation, analysis of applications involving human and animal participants, independent preparation and completion of the application	KSD_W01, KSD_W02, KSD_W06, KSD_U02, KSD_U07, KSD_K01	Evaluation of prepared projects and presentations – presentation of the completed application along with justification. Evaluation of the final written assignment – completed application to the bioethics committee.

8	**Formal aspects of conducting scientific research –** *Lists of scientific journals, bibliometric indicators*	ĆW	The aim of the course is to review lists of scientific journals and bibliometric indicators. **Course content:** List of scientific journals by the Ministry of Science and Higher Education (MNiSW). Recognized international journal rankings (Journal Citation Reports, Scopus). Journal and researcher evaluation metrics (MNiSW points, impact factor, h-index, number of citations/self-citations, etc.). "Predatory" journals, academic "cooperatives." Evaluation of researchers and academic institutions.	lecture, multimedia presentation, explanation, analysis of scientific journal lists and the ability to identify appropriate publishers for research dissemination, analysis of the individual achievements of selected researchers and academic institutions	KSD_W01, KSD_W02, KSD_U02, KSD_K01	Credit based on activity – group work, participation in a discussion on the use of scientific journal lists. Practical observation – assessment of the ability to use scientific journal lists, evaluation of the academic achievements of supervisors and selected researchers.
9	**Formal aspects of conducting scientific research –** *The publication process (peer-reviewed journals), Principles of determining co-authorship of scientific publications, The phenomenon of predatory publishers/journals*	ĆW	The aim of the course is to provide practical information on the principles of preparing and submitting a manuscript to a peer-reviewed scientific journal, as well as to highlight potential conflicts associated with the publication process. **Course content:** Publication databases and quality indicators. Types of scientific articles and criteria for selecting scientific journals. Fake and predatory publishers and journals. Publication costs and the Open Access system. Scientific journal submission systems. Structure of a scientific article. Author guidelines. Principles of correspondence with the journal's editorial board. The role of journal editors and reviewers. Rules for responding to reviews. Ethical issues: contribution to the preparation	lecture and multimedia presentation, analysis of grant proposals, preparation of projects, use of online systems and databases	KSD-W01, KSD_W03, KSD_U04, KSD_U07, KSD_K01, KSD_K05	Credit based on activity – participation in discussion, critical analysis of issues related to good publishing practices. Practical observation – assessment of skills in real conditions: use of online systems for managing scientific journals. Evaluation of prepared projects (drafting a cover letter to the editorial board, creating a detailed formal layout of an article) – assessment of the ability

			of publications, citation principles, and conflict of interest.			to prepare publication materials.
10	**Formal aspects of conducting scientific research –** *Research funding (institutions)*	ĆW	The aim of the course is to discuss the principles of preparing a research project proposal and to analyze opportunities for obtaining funding for scientific research. **Course content:** Overview of the rules for awarding funding – criteria and requirements in available calls organized by the Ministry, the National Science Centre (NCN), the National Centre for Research and Development (NCBR), the Polish National Agency for Academic Exchange (NAWA), and other possible sources. Discussion of the OSF system and preparation of the applicant's profile. Importance of proposal components and their weight in the overall evaluation.	lecture, multimedia presentation, explanation, analysis of available calls for young researchers, examples of successfully funded proposals	KSD_W06, KSD_U06, KSD_U07, KSD_K04, KSD_K07	Credit based on activity – individual and group work Practical observation – assessment of the preparation of an individual proposal, taking into account requirements, personal experience, and awareness of gaps
11	**Formal aspects of conducting scientific research –** *Preparing a grant proposal*	ĆW	The aim of the course is to provide practical guidance on preparing and completing grant applications. **Course content:** Objectives, types, and rules for selecting grant competitions. Online grant management systems. Grant application instructions and forms. Deadlines and principles for grant proposal evaluation. Key elements of the project description and budget (guidelines and common mistakes). Data management plan. Required declarations and ethical considerations.	lecture and multimedia presentation, analysis of grant applications, project preparation, use of online systems and databases	KSD_W01, KSD_W03, KSD_W06, KSD_U03, KSD_U04, KSD_U07, KSD_K01	Credit based on activity – participation in discussion, critical analysis of issues related to the key elements of developing a scientific project. Practical observation – assessment of skills in real conditions: use of online grant management systems. Evaluation of prepared projects (drafting a grant proposal based on

						the formal structure of a selected call, preparing a sample budget) – assessment of proposal development skills.
12	**Formal aspects of conducting scientific research –** *Research project management*	ĆW	The aim of the course is to develop competencies necessary for managing a research project. **Course content:** Principles of managing one's own research project. Responsibilities of the beneficiary depending on the source of funding. Cooperation with university units in the implementation of a research project. Selection of the research team (guidelines and common mistakes). Reporting progress in ongoing research. Management of the IPB (individual research plan).	lecture, multimedia presentation, explanation, analysis of selected projects from the management perspective, management of one's own project.	KSD_W01, KSD_W02, KSD_U01, KSD_U03, KSD_U06, KSD_K01, KSD_K05	Credit based on activity – group work, participation in discussion on research project management. Practical observation – discussions on managing one's own research project. Evaluation of prepared projects – individual research plan management project.
13	**Formal aspects of conducting scientific research –** *Leading a research team, collaboration.*	ĆW	The aim of the course is to develop competencies necessary for leading a research project. **Course content:** Managing a research team (tools and methods). Teamwork and principles of collaboration. Work schedule and communication rules. Leading teams with various structures – simple (within a single institution) and complex (national and international).	lecture, multimedia presentation, explanation, analysis of sample research teams from a management perspective, management of one's own team within the framework of the individual research plan	KSD_W01, KSD_W02, KSD_U01, KSD_U06, KSD_K01, KSD_K05	Credit based on activity – group work, participation in discussion on leading a research team. Practical observation – discussions on managing one's own research project. Evaluation of prepared projects – leading a research team within the framework of the individual research plan.

14	**Formal aspects of conducting scientific research –** *Research commercialization, entrepreneurship.*	ĆW	The aim of the course is to develop the ability to assess the potential for research commercialization and to cooperate with external entities. **Course content:** Definitions of commercialization, the process of direct commercialization – technology transfer center. The commercialization process and the technology offer. Revenue from commercialization. Benefits for the institution and the researcher. Projects and publication of R&D results. Licensing agreements and sales contracts. Types of patent research.	lecture, multimedia presentation, explanation, analysis of selected cases of research commercialization, inspiration to revise past and analyze future scientific research, attempt to commercialize one's own research findings.	KSD_W01, KSD_W02, KSD_W06, KSD_U03, KSD_K06, KSD_K07	Credit based on activity – group work, participation in discussion on the use of scientific journal lists. Practical observation – discussions on the commercialization process of various research findings. Evaluation of prepared projects – proposal for the commercialization of one's own research.
15	**Formal aspects of conducting scientific research –** *Presentation and self-presentation workshops.*	ĆW	The aim of the course is to: develop skills in creating and delivering presentations from the perspective of self-presentational behavior; consciously construct a coherent message on verbal, non-verbal, and content levels; build social adaptability in academic and teaching activities; and foster reflection on various methods of shaping public image (e.g., presentations at seminars, scientific conferences, and teaching activities). **Course content:** Motives, selected strategies, and styles of self-presentation; verbal, non-verbal, and behavioral tools for self-presentation; methods of shaping public image; features of effective communication; structure of a presentation.	lecture, presentation, explanation, workshops, simulations, teamwork	KSD_U04, KSD_K05, KSD_K07	Evaluation of prepared projects and presentations – assessment of the ability to develop and deliver content.

16	**Pedeutology**	ĆW	The aim of the course is to familiarize doctoral students with the components constituting teacher professionalism in the context of continuously updated knowledge, skills, and attitudes; to develop reflectiveness, authenticity, and engagement in academic and teaching work; and to foster the ability to participate in a dialogical learning process that provides all participants with space and inspiration to co-create knowledge. **Course content:** Scope of competencies of research and teaching staff, sources of change, and the socio-cultural perspective. The constellation of predispositions, skills, and knowledge of academic teachers; recognizing one's own potential. Stages of professional development of academic teachers in relation to L. Kohlberg's concept of moral development. Learning styles in D. Kolb's latest theory. Components of the social learning theory. The new professionalism of research and teaching staff. The academic teacher as a reflective practitioner. What kind of support does a young teacher/researcher need? The role of the teacher-researcher in dialogical learning/teaching.	ecture, presentation, explanation, case analysis, brainstorming, project-based method, workshops, simulations, teamwork	KSD_W05, KSD_U05, KSD_K06	Credit based on activity – group work, critical analysis of scientific content, participation in a panel discussion.
17	**Academic/specialist english**	ĆW	Improving practical English language proficiency to a level that enables its use in scientific work, including reading and studying specialist literature, preparing a manuscript for	language course in the form of practical classes, analysis of lexical and	KSD_U04, KSD_K03	Graded credit; assessment components include semester and midterm tests on

			scientific publication, preparing and delivering a scientific presentation, participating in scientific discussions within one's field of specialization, and using English in other situations related to academic activity.	grammatical issues based on the current coursebook and its digital version, as well as the instructor's own materials, pair work, group work, discussion		listening comprehension, lexical and grammatical tests, active participation in conversations and discussions during classes, and written assignments based on digital materials.
18	**Journal club**	ĆW	The aim of the course is to analyze scientific articles, including original research papers and review articles related to the student's ongoing research. The course provides substantive preparation for writing a review article and for presenting one's own research results. **Course content:** Selection and discussion of a review article relevant to the student's research, including the protocol on which the review is based. Discussion and presentation of research findings from an experimental paper written by an authority in the student's research field. Selecting journals for submitting one's own articles. Preparing the introduction for a thesis defense presentation based on the latest research. Preparing to present one's own research results and participate in discussions during academic trips and international conferences.	lecture, multimedia presentation, explanation, analysis of international scientific literature, analysis of submission requirements for one's own articles	KSD_W01, KSD_U01, KSD_U02, KSD_U04, KSD_K04, KSD_K05	Credit based on activity – group work, participation in discussions on the analysis of research results presented by other authors and one's own research. Practical observation – assessment of the scientific reliability of presented works, including the applied research methods. Evaluation of prepared presentations – presentation of key scientific articles serving as a comparison and discussion reference for one's own research.
19	**Artificial intelligence (AI) in scientific research**	ĆW	**Course objective:** The aim of the course is to develop skills in using artificial intelligence (AI) for data analysis, automation of research processes, and optimization of scientific work. Doctoral	interactive lectures combined with case study analysis, practical workshops on the use of AI	KSD_W01, KSD_W02, KSD_W04, KSD_U01,	Credit based on attendance and completion of the following:

			students will become familiar with modern AI tools and their practical applications across various scientific disciplines, with particular attention to ethical and legal considerations. **Course content:** Upon completing the course, doctoral students will be able to: Understand key AI methods, including machine learning, neural networks, natural language processing, and image analysis. Use AI in research data analysis, including Big Data exploration, pattern recognition, and predictive modeling. Automate research processes by applying AI to experiment planning, data processing, and research result management. Use advanced AI tools for automated text analysis and statistics. Critically assess and implement AI in scientific research, taking into account its limitations, ethical issues, and legal regulations. Apply AI practically in their scientific discipline by conducting a research project based on artificial intelligence methods.	tools and data analysis, teamwork on research projects, independent literature review, and automated analysis of scientific texts	KSD_U02, KSD_K01	Research project – development and implementation of an AI-based solution in a selected research area, including assessment of methodological accuracy and interpretation of results. Presentation of results – discussion of the applied AI techniques, analysis of their effectiveness, and conclusions drawn from the research.
20	**Semester seminar**	S	The aim is to present the current state and progress of work on the research problem outlined in the doctoral dissertation, and to support doctoral students through professional, critical, and constructive discussion among researchers from various disciplines and all doctoral students of the Doctoral School. The seminar is organized in an open format, with the participation of interested parties or invited guests from within and outside the University.	discussion on the doctoral student’s presentation	KSD_W01, KSD_U04, KSD_U06, KSD_K04	Credit based on the preparation and delivery of the presentation as well as the doctoral student's written responses to questions in the form of a report.

21	**Mid-term seminar with the evaluation committee (as part of the mid-term evaluation)**	S	The seminar constitutes the open part of the mid-term evaluation of the doctoral student's Individual Research Plan (IRP) at the end of the fourth semester of training. The objective is to present the research activities completed according to the IRP schedule before a committee appointed by the University's Academic Council. The seminar is open in format, meaning that in addition to the committee, it may be attended by all interested individuals and invited guests from within and outside the University.	discussion on the doctoral student's presentation	KSD_U01, KSD_K01	Credit based on the presentation of the implementation of the Individual Research Plan (IRP).
22	**Professional practice: conducting teaching activities**	P	Doctoral students conduct teaching sessions with student groups as lecturers or assist in such classes. The aim is to familiarize them with the specifics of academic teaching work in terms of content, organization, and pedagogy. The doctoral student selects or is assigned to classes according to their professional competencies, educational profile, and the needs of the University.	Independent teaching or assisting in conducting teaching activities.	KSD_W05, KSD_U05, KSD_K06, KSD_K07	Credit based on the submitted documentation of the internship completion.

W – lecture
ĆW – exercises
S – seminar
P – practice