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POLITECHNIKA BIAŁOSTOCKA

COURSE DESCRIPTION CARD

Course name	Methodologies for Empirical Studies				
Course type	optional	**Course code**	SDPB0055	**ECTS credits**	**2**
Forms and number of hours	lecture: 20 h	**Scientific discipline**	all disciplines		

Course objectives	To acquaint students with basic techniques used in experimental research, which practically each of them will have to apply in their doctoral dissertations. In addition to reviewing various experimental architectures, the lectures will focus on intuition and the logic of exploring the world (and thus also learning about the properties of artificial creations, such as the products of engineering work), the importance of causality, various problems encountered by a scientist in exploring the world, and new ways of empirical research, such as computationally-intensive methods, discovering causality from data, or computer simulation.
Course content	1. The importance of empirical methods 2. Uncertainty, elements of statistics 3. Causality and probability 4. Classical design of experiments (2) 5. Problems in the laboratory 6. Computationally intensive methods (Monte Carlo, bootstrap, randomization) 7. Discovering causality from data (2) 8. Simulation, artificial societies
Teaching methods	Lectures enhanced with discussions with their participants
Assessment method	Presence, term project

Symbol of learning outcome	Learning outcomes	Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes
LO1	Knows and understands the methodology of scientific research.	SD_W3	Discussions, project
LO2	Can use knowledge from various 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 research, formulate a research hypothesis, - develop research methods, techniques and tools and use them creatively, - make conclusions based on the results of scientific research.	SD_U1	Discussions, project

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LO3	Can make a critical analysis and evaluation of the results of scientific research, expert activity and other creative works and their contribution to the development of knowledge.	SD_U2	Discussions, project
LO4	Can communicate on specialist topics to a degree enabling active participation in the international scientific environment.	SD_U4	Discussions, project

Student workload (in hours)	
Lecture	20
Consultations	1
The unassisted student work	20
Implementation of project tasks and preparation for and participation in exams/tests	10
Total	**51**
ECTS credits	**2**

Basic references	1. Robert Rosenthal, Ralph L. Rosnow, "Essentials of Behavioral Research: Methods and Data Analysis", New York: McGraw-Hill, 1991, ISBN 0-07-053929-4 2. Donald T. Campbell, Julian C. Stanley, "Experimental and Quasi-Experimental Designs for Research", Boston: Houghton Mifflin Co., 1966, ISBN 0-395-30787-2
Supplementary references	1. Jacob Cohen. "The Earth Is Round (p<.5)." American Psychologist, 49(12), 997-1003, 1994 2. Paul R. Cohen, "Empirical Methods for Artificial Intelligence", The MIT Press, Cambridge, MA, 1995, ISBN: 0-262-03225-2 3. Marek J. Druzdzel & Clark Glymour. "Application of the TETRAD II Program to the Study of Student Retention in U.S. Colleges." In Proceedings of the AAAI-94 Workshop on Knowledge Discovery in Databases (KDD-94), pages 419-430, Seattle, WA, 1994, available at: http://www.pitt.edu/~druzdzel/abstracts/kdd94.html 4. Ward Edwards, Harold Lindman & Leonard J. Savage. "Bayesian Statistical Inference for Psychological Research." Psychological Review, 70(3), 1963 5. Joshua M. Epstein and Robert Axtell. "Growing Artificial Societies: Social Science from the Bottom Up." A Monograph of the 2050 Project, To be published by MIT Press, 1996. Chapters I & II. 6. Ruma Falk. "Misconceptions of Statistical Significance." Journal of Structured Learning, 9, 83-96, 1986 7. Sir Ronald A. Fisher. "The Design of Experiments." Chapter 2, "The Principles of Experimentation, Illustrated by a Psycho-Physical Experiment," pages 11-26, Oxford: Oxford University Press, 1990 8. Sigmund Freud. "Beitrag zur Kenntniss der Cocawirkung (Contribution to the Knowledge of the Effect of Cacaine)." Wiener Medizinische Wochenschrift, 35(5), 130-133, 1885

	9. Clark Glymour, Richard Scheines, Peter Spirtes & Kevin Kelly. "Discovering Causal Structure: Artificial Intelligence, Philosophy of Science, and Statistical Modeling." Chapters 1-3, pages 3-59, San Diego, CA: Academic Press, Inc, 1987
	10. Lee W. Gregg & Herbert A. Simon. "Process Models and Stochastic Theories of Simple Concept Formation." Journal of Mathematical Psychology, 4, 246-276, 1967
	11. Adolf Grünbaum. "Validation in the Clinical Theory of Psychoanalysis: A Study in the Philosophy of Psychoanalysis." Chapter 10 on Freud's theory of dreams, Madison, CT: International Universities Press, 1993

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