DOCTORAL SCHOOL
Of the UTP University of Science and Technology
in Bydgoszcz

SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	1
Subject	**RESEARCH METHODOLOGY AND PLANNING**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Anna Wenda-Piesik
Teachers creating the syllabus	Engineering and technical sciences dr hab. inż. Adam Lipski, prof. uczelni Natural sciences prof. dr hab. inż. Anna Wenda-Piesik

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I	30		
II	30*		

*subject implemented separately in a discipline or group of disciplines

3. PROGRAMME

Lectures	**Semester I** **Natural Sciences** **prof. dr hab. inż. Anna Wenda-Piesik** Lecture 1. The scientific paradigm and its importance in the civilisational development Lecture 2. Definitions and structure of science. Science as creativity, heuristics. Lecture 3. Types of human knowledge. Characteristics of scientific knowledge. Lecture 4. Deduction and deductive learning. Development stages of deductive systems. Lecture 5. Deductive conclusions in the development of logic. Lecture 6. Empiricism and inductive methods. Full enumerative induction and eliminative induction according to Bacon. Lecture 7. Mill's canons. Lecture 8. Reasoning and justification in science. Lecture 9. Principles for investigating scientific problems. Lecture 10. Methods of analysis and synthesis in applied research. Lecture 11. Coincidence, imagination, talent, and intuition in science. Lecture 12. Conceptualism and concepts of research processes.

Lecture 13. Classification of sciences according to criteria of subject and methodology.
Lecture 14. Division and degrees of scientific classification.
Lecture 15. Recognition, power of influence of the researcher.

Semester II
Engineering and technical sciences
dr hab. inż. Adam Lipski, prof. uczelni

The test subject as a data source. Classification of the quantities characterising the test object. Mathematical model and function of the test object. Evaluating progress and analysing research results with use of research plans.
Classification and characteristics of research plans.
General criteria for selecting a research plan.
Studies on the significance of impact. Objectives. Types of plans, their characteristics and structure.
Complete plans. Objectives. Types of plans, their characteristics and construction.
Selective plans. Objectives. Types of plans, their characteristics and construction.
Optimisation plans. Objectives. Types of plans, their characteristics and construction.

Natural sciences
prof. dr hab. inż. Anna Wenda-Piesik

Lecture 1. History and development of experimental methods in natural sciences worldwide.
Lecture 2. Introduction to experimental methods (Experiment vs. science, paradoxes of experiment deformation and artificiality).
Lecture 3. Formulating and justifying the subjects of scientific work, setting the objectives of research work, putting forward hypotheses, the role of hypotheses, conclusions.
Lecture 4. Introduction to statistics, role of statistics in research, validation of data. Advantages and disadvantages of statistics.
Lecture 5. Introduction to measurement theory and typical errors made during research.
Lecture 6. Types of measurement scales and utilising statistics at different scales. Review of statistical methods for data analysis.
Lecture 7. Rules for sampling, observation and measurement on different natural populations.
Lecture 8. Digitisation and preparation of empirical data for statistical analyses in various statistical programmes.
Lecture 9. Experience as a research method in natural sciences.
Lecture 10. Classification of experiments according to different criteria: site and experimental unit, number of factors studied, arrangement of the experiment (method of sampling), repetition on site and in seasons (series of experiments).
Lecture 11. Basic principles of experimentation in the laboratory, in the vegetation hall, and in the field. Devising research plans.

	Lecture 12. Breakdown and characteristics of research methods in natural sciences: observational study, experimental study, survey study, and the interview method. Lecture 14. Types of questions, questionnaire structure, determination of the sample size and the way of its selection (random, systematic, layered, group selection). Preparation of data for analysis. Lecture 15. Selection (and justification) of the research problem, aspects of the research problems, and identification of research tasks. Cognitive and utilitarian goals in natural sciences. Lecture 16. Research concepts in the discipline of agriculture and horticulture. Lecture 17. The concept of research in zootechnics and fisheries.

4. DIDACTIC METHODS

multimedia lecture, demonstration, discussion, prelection, situational method

5. REQUIREMENTS FOR PASSING

written exam, project preparation, submission of a research paper

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_a	Scope and depth - completeness of cognitive perspective and interconnections (a) allowing revision of existing paradigms – world-wide legacy, including the theoretical basis and general and selected specific issues – relevant to the scientific or artistic discipline at hand
P8S_WG_c	Scope and depth - completeness of cognitive perspective and interconnections c) research methodology
ABILITIES: the student is able to	
P8S_UW_a	Utilisation of knowledge – resolving problems and completing tasks a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results.
P8S_UW_b	Utilisation of knowledge – resolving problems and completing tasks b) critically analyse and evaluate the results of research, works of experts, and other creative works, and judge their contribution to the development of science

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_a		X				
P8S_WG_c		X				
P8S_UW_a					X	
P8S_UW_b					X	

8. READING LIST

Primary reading list	**Engineering and technical sciences** **dr hab. inż. Adam Lipski, prof. uczelni** 1. Polański Z., 1984. Planowanie doświadczeń w technice. PWN, Warszawa. 2. Kukiełka L., 2002. Podstawy badań inżynierskich. PWN, Warszawa. **Natural sciences** **prof. dr hab. inż. Anna Wenda-Piesik** 1. Uwe Flick. Projektowanie badania jakościowego, Original title: Designing Qualitative Research. Warszawa, 1, 2020, Publisher: Wydawnictwo Naukowe PWN. 2. Steinar Kvale. Prowadzenie wywiadów. Warszawa, 1, 2020, Publisher: Wydawnictwo Naukowe PWN. 3. David Silverman. Prowadzenie badań jakościowych. 2020, Publisher: Wydawnictwo Naukowe PWN. 4. Stefan Nowak. Metodologia badań społecznych. Warszawa, 2012, Publisher: Wydawnictwo Naukowe PWN. 5. Graham Gibbs. Analizowanie danych jakościowych. Original title: Analyzing Qualitative Data. Issue: Warszawa, 1, 2011. Publisher: Wydawnictwo Naukowe PWN 6. Zbigniew Bokszański. Indywidualizm a zmiana społeczna. Issue: Warszawa, 1, 2007, Publisher: Wydawnictwo Naukowe PWN 7. David Silverman. Interpretacja danych jakościowych. Issue: Warszawa, 1, 2020 8. Publisher: Wydawnictwo Naukowe PWN 9. Henryk Grabowski. Lecturey z metodologii badań empirycznych. Warszawa 2014. Wydawnictwo Impuls.
Complementary reading list	**Engineering and technical sciences** **dr hab. inż. Adam Lipski, prof. uczelni** 1. Korzyński M., 2006. Metodyka eksperymentu. Planowanie, realizacja i statystyczne opracowanie wyników eksperymentów technologicznych. WNT, Warszawa. 2. Pająk E., Wieczorowski K., 1982. Podstawy optymalizacji operacji technologicznych w przykładach. PWN, Warszawa. 3. Mańczak K., 1976. Technika planowania eksperymentu. WNT, Warszawa. 4. Rekab K., Shaikh M., 2005. Statistical Design of Experiments with Engineering Approach. Chapman & Hall/CRC. Taylor & Francis Group. 5. Jiju A., 2003. Design of Experiments for Engineers and Scientists. Butterworth-Heinemann. **Natural sciences** **prof. dr hab. inż. Anna Wenda-Piesik** 1. Franfort-Nachmias Ch, Nachmias D. 2002. Metody badawcze w naukach społecznych. Wydawnictwo Zysk i S-ka, Poznań. 2. Meissner W. 2010. Przewodnik do ćwiczeń z przedmiotu. Metody statystyczne w biologii. W UG, Gdańsk.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	2
Subject	**PHILOSOPHY OF COGNITION**
Subject coordinator responsible for creating the syllabus	dr Zofia Zgoda
Teachers creating the syllabus	dr Zofia Zgoda

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I	15		

3. PROGRAMME

Lectures	1. Philosophy of cognition, theory of cognition, epistemology, gnoseology – preliminary issues, problems with definitions. Epistemology vs. detailed sciences. Cognition in science and philosophy. 2. The question of the sources of cognition – genetic and methodological approach: empiricism, rationalism, irrationalism. The dispute over the subject and limits of cognition: epistemological idealism, epistemological realism. Historical review of positions. 3. The issue of truth in philosophy – classical and non-classical theories of truth. Semantic definition of truth. Deflationism and anti-deflationism. 4. Development of methodological reflection in the philosophy of the turn of the 19th and 20th century – the problem of scientific cognition – the philosophy of science. Concepts of K. Popper, Th. Kuhn, P.K. Feyerabend, Duhem-Quine thesis. 5. Main directions of contemporary epistemology: constructivism, postmodernism, neopragmatism, naturalism, anti-naturalism.

4. DIDACTIC METHODS

multimedia lecture, discussion

5. REQUIREMENTS FOR PASSING

written test

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_a	Scope and depth - completeness of cognitive perspective and interconnections (a) allowing revision of existing paradigms – world-wide legacy, including the theoretical basis and general and selected specific issues – relevant to the scientific or artistic discipline at hand
P8S_WG_c	Scope and depth - completeness of cognitive perspective and interconnections c) research methodology
P8S_WK_a	Context – conditions, effects

	a) fundamental issues of the modern civilisation
P8S_WK_b	Context – conditions, effects b) economical, legal, ethical, and other important aspects of scientific activities
SOCIAL SKILLS: the student is ready to	
P8S_KK_a	Assessment – critical approach a) critically assess the achievements in the scientific or artistic discipline concerned
P8S_KK_c	Assessment – critical approach c) recognise the importance of knowledge in solving cognitive and practical problems

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Written Exam	Discussion	Test	Presentation	Project	Report
P8S_WG_a	X	X				
P8S_WG_c	X	X				
P8S_WK_a		X				
P8S_WK_b		X				
P8S_KK_a		X				
P8S_KK_c		X				

8. READING LIST

Primary reading list	1. Woleński J., 2005, Epistemologia. Poznanie, prawda, wiedza, realizm, Wydawnictwo Naukowe PWN, Warszawa. 2. Hetmański M. (red.), 2008, Epistemologia współcześnie, Universitas, Kraków. 3. Sady W., 2000, Spór o racjonalność naukową od Poincare`go do Laudana, Monografie Fundacji na rzecz Nauki Polskiej, Wrocław.
Complementary reading list	1. Heller M., 2011, Filozofia nauki. Wprowadzenie, Wydawnictwo Petrus, Kraków. 2. Morton A., 2002, Przewodnik po teorii poznania, Wydawnictwo Spacja, Warszawa.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	3
Subject	**RETHORIC**
Subject coordinator responsible for creating the syllabus	dr Marta Kładź-Kocot
Teachers creating the syllabus	dr Marta Kładź-Kocot

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I	15		

3. PROGRAMME

Lectures	Rhetoric as *ars bene dicendi*. History of rhetoric. Stylistic devices and rhetorical tropes. Structure of a rhetorical expression. Concepts of persuasion and manipulation. Methods and techniques of argumentation. Effective techniques of persuasion. Techniques of self-presentation and the art of public speaking.

4. DIDACTIC METHODS

lecture, multimedia lecture, discussion, prelection

5. REQUIREMENTS FOR PASSING

oral exam

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
ABILITIES: the student is able to	
P8S_UK_a	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (a) communicate on specialised topics to a degree which allows for active participation in an international scientific community
P8S_UK_b	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (b) disseminate the results of scientific activities, including in popular forms
P8S_UK_c	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (c) initiate debates

P8S_UK_d	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (d) participate in the scientific discourse
SOCIAL SKILLS: the student is ready to	

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_UK_a				X		
P8S_UK_b				X		
P8S_UK_c				X		
P8S_UK_d				X		

8. READING LIST

Primary reading list	1. Barłowska M., Budzyńska-Daca A., Wilczek P. (red), 2008, *Retoryka*, Wydawnictwo Naukowe PWN. 2. Korolko M., 1990, *Sztuka retoryki. Przewodnik encyklopedyczny*, Wiedza Powszechna. 3. Barłowska M., Budzyńska Daca A., Załęska M., 2010, *Ćwiczenia z retoryki*, Wydawnictwo Naukowe PWN. 4. Budzyńska-Daca A., Kwosek J., 2009, *Erystyka, czyli o sztuce prowadzenia sporów*, Wydawnictwo Naukowe PWN. 5. Beck G., 2010, *Wyższa szkoła skutecznej retoryki*, Wydawnictwo Helion. Beck G., 2007, *Zakazana retoryka. Podręcznik manipulacji*, Wydawnictwo Helion.
Complementary reading list	1. Meyer M., Carrilho M. M., Timmermans B., 2010, *Historia retoryki od Greków do dziś*, Wydawnictwo Aletheia. Schopenhauer A., *Erystyka, czyli sztuka prowadzenia sporów*, whichever publisher.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	4
Subject	**NUMERICAL METHODS**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Dariusz Skibicki
Teachers creating the syllabus	prof. dr hab. inż. Dariusz Skibicki

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I	15		

3. PROGRAMME

Lectures	Lecture 1. Floating-point arithmetic in information technology. Errors in computer technology, truncation errors and rounding errors. Lecture 2. Linear matrix algebra. Basic properties of the matrix. Solving systems of linear equations, precise methods, iterative methods. Lecture 3. Linear and non-linear approximation, one and multiple variables. Measures of quality assessment of approximation. Lecture 4. Interpolation. Interpolation polynomials of Newton and Lagrange. Application of interpolation in computer graphics - parametric interpolation. Lecture 5. Numerical integration. The trapezoidal rule and Simpson rule, Gaussian quadrature. Numerical differentiation. Forward, backward, and centred methods. Lecture 6. Solving non-linear equations and arrangements of non-linear equations. Secant method and bisection method. Newton-Raphson method in relation to solving nonlinear equations and systems of nonlinear equations. Lecture 7. Solving differential equations. Preliminary issues. Euler method, Heun's method, and Runge-Kutta methods. Boundary value problem. Finite difference method. Finite element method.

4. DIDACTIC METHODS

e.g. multimedia lecture with a demonstration of methods on a spreadsheet.

5. REQUIREMENTS FOR PASSING

test

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_c	Scope and depth - completeness of cognitive perspective and interconnections c) research methodology
ABILITIES: the student is able to	
P8S_UW_a	Utilisation of knowledge – resolving problems and completing tasks a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results.
P8S_UW_b	Utilisation of knowledge – resolving problems and completing tasks b) critically analyse and evaluate the results of research, works of experts, and other creative works, and judge their contribution to the development of science
SOCIAL SKILLS: the student is ready to	
P8S_KK_c	Assessment – critical approach c) recognise the importance of knowledge in solving cognitive and practical problems

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_a			X			
P8S_UW_a			X			
P8S_UW_b			X			
P8S_KK_c			X			

8. READING LIST

Primary reading list	1. Skibicki D., Nowicki K., Metody numeryczne w budowie maszyn, Wydawnictwa Uczelniane Akademii Techniczno-Rolniczej w Bydgoszczy, 2006 2. Chapra, Steven C., Canale, Raymond P., Numerical methods for engineers. McGraw Hill Education 7th ed, New York 2015.
Complementary reading list	1. Recktenwald, Gerald, Numerical Methods with Matlab. Implementation and Application. Prentice Hall, New Jersey 2000.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	5
Subject	**ENGLISH LANGUAGE IN SCIENCE**
Subject coordinator responsible for creating the syllabus	Head of the Foreign Languages Institute
Teachers creating the syllabus	Engineering and technical sciences mgr Barbara Gałgańska Natural sciences mgr Małgorzata Borowska

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I		15*	
II		15*	
III		15*	
IV		15*	

*subject implemented separately in a discipline or group of disciplines

3. PROGRAMME

Laboratory	**Engineering and technical sciences** **mgr Barbara Gałgańska** 1. Great scientists and their discoveries which revolutionised the world (electricity, telephone, aviation, computer, Internet) Polish inventors. 2. The conquest of space (flights to the moon, colonisation of Mars, space ferries, major disasters). 3. Causes of equipment failure in various industries (chemical industry, power plants, transport industry, air travel industry) examples of failures due to material fatigue. 4. Basic ideas in mechanics (friction, material fatigue – stress, processes of material removal and material deposition, 3D printing). 5. Technology in communication (evolution of communication, mobile phones, security measures, Internet communication). 6. Technology in business (running a business, means of communication, online business, advertising). 7. Modern materials in various areas of life (medicine, construction, transport, household). 8. Sustainable development (ecology in different areas of life). 9. Alternative energy sources (wind, solar, and nuclear power). 10. Mechanical devices designed by UTP employees (statue of Mr Twardowski, a wheelchair, grabbing device for laparoscopy).

	Natural sciences **mgr Małgorzata Borowska** 1. Water and air pollution. 2. Renewable energy. 3. Soil erosion. 4. Endangered species. 5. Recycling. 6. Waste management. 7. Nutrition and GMOs. 8. Enzymes and hormones. 9. Horticulture. 10. Landscape design and architecture. 11. Composting and mulching. 12. Fertilisers. 13. Different styles of writing scientific works, scientific articles, and presenting research at a conference.

4. DIDACTIC METHODS

discussion, presentation translation, contest, didactic exercises

5. REQUIREMENTS FOR PASSING

oral statement, written exam, test, technical text translation, presentation.

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
ABILITIES: the student is able to	
P8S_UK_a	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (a) communicate on specialised topics to a degree which allows for active participation in an international scientific community
P8S_UK_e	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language e) use a foreign language at level B2 in the Common European Framework of Reference for Languages, to the extent necessary for participation in an international professional scientific community
SOCIAL SKILLS: the student is ready to	

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing				
	Oral statement	Written statement	Test	Presentation	Exam
P8S_UK_a	X	X	X	X	X
P8S_UK_e	X	X	X	X	X
P8S_KK_a	X			X	

8. READING LIST

Primary reading list	**Engineering and technical sciences** **mgr Barbara Gałgańska** 1. Gałgańska B., 2010. Mechanical Devices Make Life Easier. Wydawnictwa uczelniane UTP. **Natural sciences** **mgr Małgorzata Borowska** 1. Armer, T., 2011. Cambridge English for Scientists. Cambridge 2. Borowska, M., 2010. Animal Breeding and Biology: Professional English Textbook. Wydawnictwa Uczelniane UTP w Bydgoszczy. 3. Burczyk, K., 2008. English Texts: Agriculture and Animal Breeding. Wydawnictwa Uczelniane UTP w Bydgoszczy 4. Kloc, E., 2009. English for Students of Horticulture. Wydawnictwo Uniwersytetu Rolniczego w Krakowie
Complementary reading list	**Engineering and technical sciences** **mgr Barbara Gałgańska** 1. Otto B & M., 2005 Here is the News 1, 2, Oxford University Press **Natural sciences** **mgr Małgorzata Borowska** 1. Otto, M., B., 2007, Here is the news, Part 1. Poltex.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	6
Subject	**ESSENTIAL INFORMATION ON GRANTS**
Subject coordinator responsible for creating the syllabus	dr hab. inż. Michał Choraś, prof. uczelni
Teachers creating the syllabus	dr hab. inż. Michał Choraś, prof. uczelni dr hab. inż. Jolanta Tomaszewska, prof. uczelni

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
II	15		

3. PROGRAMME

Lectures	1. Formal aspects of the grant application: programme types, project types, budget and eligible costs in projects, break-down of costs by the purpose of expenditure (direct/indirect/other), basis for evaluating the application. 2. Consortium building aspects of grant projects: initialisation of the consortium, meetings/events to help establish consortia, where it is worthwhile to visit, types of partners, geographical and competence balance, division of roles in the project. 3. Aspects related to communication and working in a multicultural environment, tools helpful in working on research proposals. 4. Substantive parts of the grant application: - Formulation of the research problem, analysis of the current state of knowledge in the scientific field of the grant applied for, setting research objectives (also beyond the current state), definition of key performance indicators - Implementation of research – planning with the use of project management tools (PERT and Gantt charts), division of work into packages, identification of milestones, estimation of workload needed to achieve them, risk analysis, budgeting - Evaluation of the impact of research works on the scientific environment and society – identification of end users, aspects of dissemination of results (identification of channels and content) and business modelling (commercialisation), interdisciplinarity. - Ethical aspects, privacy, data protection, GDPR, social aspects of research, gender aspects, security aspects - Coordinator's role, partner's role, aspects related to effective management of research projects

4. DIDACTIC METHODS

multimedia lecture

5. REQUIREMENTS FOR PASSING

test

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_c	Scope and depth - completeness of cognitive perspective and interconnections c) research methodology
P8S_WG_d	Scope and depth - completeness of cognitive perspective and interconnections d) rules for dissemination of scientific results, including through open access
P8S_WK_c	Context – conditions, effects c) basic principles for the transfer of knowledge to the economic and social sphere and for the commercialisation of scientific results and know-how relating to those results
ABILITIES: the student is able to	
P8S_UW_a	Utilisation of knowledge – resolving problems and completing tasks a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results.
P8S_UW_c	Utilisation of knowledge – resolving problems and completing tasks c) transfer the results of scientific activities to the economic and social sphere
P8S_UO_a	Work organisation - planning and teamwork (a) plan and implement individual and collaborative research or creative projects, including in an international environment
SOCIAL SKILLS: the student is ready to	

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_c			X			
P8S_WG_d			X			
P8S_WK_c			X			
P8S_UW_a			X			
P8S_UW_c			X			
P8S_UO_a			X			

8. READING LIST

Primary reading list	1. www.granty-na-badania.com, Jak złożyć dobry wniosek do NCN? 2. https://www.kpk.gov.pl/ - materiały informacyjne, szkolenia KPK
Complementary reading list	

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	7
Subject	**DATA ANALYSIS - STATISTICS, DATA VISUALISATION**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Anna Wenda-Piesik
Teachers creating the syllabus	Engineering and technical sciences dr hab. inż. Adam Lipski, prof. uczelni dr inż. Krzysztof Nowicki Natural sciences prof. dr hab. inż. Anna Wenda-Piesik

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
II		15*	
III		30*	

*subject implemented separately in a discipline or group of disciplines

3. PROGRAMME

Laboratory	**Semester II** **Engineering and technical sciences** **dr hab. inż. Adam Lipski, prof. uczelni** 1. The test object as a data source. Basic methods of data presentation. 2. Descriptive statistics. Selected indicators of position and scattering. 3. Random variables. Selected discrete and continuous probability distributions. Generating random variables. 4. Statistical inference. Methods of estimator determination. Parametric estimation. Determination of minimum sample size. 5. Checking statistical hypotheses. Selected statistical tests. 6. Analysis of dependence of two quantitative variables. Correlation. Regression equation. The confidence interval of the regression equation. Outlier and influential values. 7. Using statistical methods for quality assurance. 8. Selected information regarding stochastic processes. **Natural sciences** **prof. dr hab. inż. Anna Wenda-Piesik** 1. Introduction to descriptive statistics for samples and general populations. Types of empirical distributions. Assumptions of correctness of statistical analyses, data transformations.

	2. Theory of parametric estimation and practical application of estimators in scientific research. Theory of compatibility, randomness, and independence tests. 3. Statistical inference methods. Structure of the significance test, Student's t-test and its modifications. 4. Stochastic relationship analyses (linear and non-linear estimations) in two-dimensional populations. 5. Introduction to the analysis of variance, linear ANOVA models and graphic presentation of results from various studies in natural sciences. Use of statistical packages for calculations: Statistica 13.0 and Excel spreadsheet. **Semester III** **Engineering and technical sciences** **dr inż. Krzysztof Nowicki** 1. Regressions – simple, multiple, stepwise, nonlinear, logistic, residual analysis. 2. Elements of experiment planning. 2. Analysis of variance / covariance – univariate, multivariate, hierarchical, multivariate, repeated measurements, variational components. 3. Canonical Analysis 4. Discriminant analysis 5. Cluster analysis 6. Principal components analysis 7. Factor analysis 8. Log Line Analysis **Natural sciences** **prof. dr hab. inż. Anna Wenda-Piesik** 1. Use of multidimensional techniques in the development of data from natural experiments (genetics, breeding) – cluster analysis (dendrograms, *k*-means method). 2. MANOVA in the development of agricultural data in tests of multiple comparisons from the *post* group. 3. Applications of multidimensional exploratory techniques (analysis of main components and factor analysis). 4. Factor analysis and cross-linking of environmental research data (screenings). 5. Methods of analysis of survey data. Selected methods of analysis of results expressed in nominal and order scale: c^2 non-parametric tests, Wilcoxon test, Mann-Whitney test, Cramér's V, Kendall's τ coefficient, Spearman's ρ coexistence measures. Statistical and factual conclusions.

4. DIDACTIC METHODS

multimedia lecture, laboratory classes, situational method, data analysis using statistical software

5. REQUIREMENTS FOR PASSING

written exam, project preparation with data visualisation, submission of a research paper

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
ABILITIES: the student is able to	
P8S_UW_a	Utilisation of knowledge – resolving problems and completing tasks

	a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results
P8S_UW_b	Utilisation of knowledge – resolving problems and completing tasks b) critically analyse and evaluate the results of research, works of experts, and other creative works, and judge their contribution to the development of science

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_UW_a		X			X	
P8S_UW_b					X	X

8. READING LIST

Primary reading list

Semester II

Engineering and technical sciences

1. Klonecki W., Statystyka dla inżynierów. PWN, Warszawa, 1999.
2. Hellwig Z., Elementy rachunku prawdopodobieństwa i statystyki matematycznej. PWN, Warszawa, 1998.

Natural sciences

1. Dawn Griffiths. Statystyka (original title: Head First Statistics). Wydawnictwo Helion S.A. Gliwice, 2010, number of pages: 711.
2. Adam Łomnicki. Wprowadzenie do statystyki dla przyrodników, Wydawnictwo Naukowe PWN, Warszawa, wydanie 5, 2019 number of pages: 245.
3. Mieczysław Sobczyk. Statystyka. Wydawnictwo Naukowe PWN, Warszawa, 5, 2020, number of pages: 356.
4. Andrzej Luszniewicz, Teresa Słaby. Statystyka z pakietem komputerowym STTISTICA PL. Wydawnictwo C.H. Beck, 2008, number of pages: 472.
5. Ryszard Błażejewski. Wstęp do badań empirycznych. Wydawnictwo Akademii Rolniczej w Poznaniu, Poznań 1999, number of pages: 101.

Semester III

Natural sciences

1. Andrzej Stanisz, Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 1. Statystyki podstawowe, Wydawca: StatSoft Polska Wydanie: Kraków, 2006, Number of pages: 532.
2. Andrzej Stanisz, Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny Tom 2. Modele liniowe i nieliniowe, Wydanie: Kraków, 2007, Number of pages: 868.
3. Andrzej Stanisz, Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny Tom 3. Analizy wielowymiarowe, Wydanie: Wydanie: Kraków, 2007, Number of pages: 500.
4. Franfort-Nachmias Ch., Nachmias D. 2002. Metody badawcze w naukach społecznych. Wydawnictwo Zysk i S-ka, Poznań, number of pages: 616.

Complementary reading list	**Semester II** **Engineering and technical sciences** 1. Hyk W., Stojek Z., Analiza statystyczna w laboratorium badawczym. PWN, Warszawa, 2019. 2. Metcalfe A.V., Statistics in Engineering. A practical approach. Chapman & Hall, 1994. **Natural sciences** 1. Meissner W. 2010. Przewodnik do ćwiczeń z przedmiotu. Metody statystyczne w biologii. W UG, Gdańsk 2. Gołaszewski J., Puzio-Idźkowska M., Stawiana-Kosiorek A., Załuski D. 2003. Statystyka dla przyrodników, Wyd. UWM, Olsztyn, number of pages: 265. 3. Sokal R, Rohlf. Biometry. W.H. Freeman and Company, New York, 1981, number of pages: 859. **Semester III** **Engineering and technical sciences** 1. Aneta Ptak-Chmielewska, Uogólnione modele liniowe, Oficyna Wydawnicza szkoła Głowna Handlowa w Warszawie, 2013, number of pages: 141. 2. Bill Shipley. Cause and correlation in Biology (A user's guide to path analysis, structural equations and causal inference). Cambridge University Press, Cambridge, 2000, number of pages 318. 3. Norm O'Rourke, Larry Hatcher, Edward J. Stepanski. A step-by-step Approach to Using SAS for Univariate & Multivariate Statistics, SAS Institute, North Carolina, 2009, number of pages: 513.

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in Bydgoszcz

SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	8
Subject	**PREPARATION OF ARTICLES AND SCIENTIFIC PRESENTATIONS**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Elwira Śliwińska
Teachers creating the syllabus	prof. dr hab. inż. Elwira Śliwińska dr hab. inż. Beata Jędrzejewska, prof. uczelni dr hab. inż. Ireneusz Grubecki, prof. uczelni

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
III	15		
IV	15		

3. PROGRAMME

Lectures	**Semester III** Methods of searching for scientific information. Parametric tools for publications and authors, search engines for journals and scientific publications (Scopus, Web of Science, Google Scholar), Scientific Publishers, lists of ranked scientific journals. Methods of promoting scientific activity – creating web profiles (e.g. ResearchGate, ResearcherID, Google Scholar, Web of Science, ORCID), presentations, conferences, and research posters. Rules of preparing multimedia presentations and posters – formal and technical requirements, data visualisation. The role of a scientific article; publication purposes, types of scientific articles, journal choice. **Semester IV** Editing a scientific article – technical requirements. Text editors, spreadsheets and visualisations, graphic software, bibliography software, chemical and mathematical formula editors. Rules of preparing a scientific publication – formal requirements. Structure of a scientific article; manner of writing individual elements of the article: title, abstract, theoretical introduction, research methodology, review and discussion of results, summary and conclusions, nomenclature, etc. Sending the article to the journal and the formalities after it has been accepted for print.

4. DIDACTIC METHODS

lecture, multimedia presentation, work with source material

5. REQUIREMENTS FOR PASSING

Semester III: presentation Semester IV: assignment

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_c	Scope and depth - completeness of cognitive perspective and interconnections c) research methodology
P8S_WG_d	Scope and depth - completeness of cognitive perspective and interconnections d) rules for dissemination of scientific results, including through open access
ABILITIES: the student is able to	
P8S_UW_a	Utilisation of knowledge – resolving problems and completing tasks a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results.
P8S_UW_b	Utilisation of knowledge – resolving problems and completing tasks b) critically analyse and evaluate the results of research, works of experts, and other creative works, and judge their contribution to the development of science
P8S_UK_b	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language b) disseminate the results of scientific activities, including in popular forms
SOCIAL SKILLS: the student is ready to	
P8S_KK_b	Assessment – critical approach b) critically assess their own contribution to the development of the scientific or artistic discipline concerned
P8S_KR	Professional role – independence and development of ethos - maintain and develop the ethos of the research community, including: conducting scientific activities in an independent manner

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_c				X		X
P8S_WG_d				X		X
P8S_UW_a				X		X
P8S_UW_b				X		X
P8S_UK_b				X		X
P8S_KK_b				X		X
P8S_KR				X		X

8. READING LIST

Primary reading list	**Semester III** 1. Wasylczyk P., 2017. Prezentacje naukowe. Praktyczny poradnik dla studentów, doktorantów i nie tylko. Wydawnictwo Naukowe PWN, Warszawa.

	2. Zabielski R., Godlewski M. M., 2011. Przewodnik prezentowania informacji naukowej. Katedra Nauk Fizjologicznych Wydział Medycyny Weterynaryjnej SGGW, Warszawa. 3. https://epodreczniki.pl/a/tworzenie-prezentacji/DOPPeVhVM 4. Elektroniczne zasoby licencjonowane przez UTP oraz ogólnodostępne bazy danych i katalogów czasopism elektronicznych. **Semester IV** 1. Liśkiewicz T., Liśkiewicz G., 2014. Wprowadzenie do efektywnego publikowania naukowego. Jak przygotować, wysłać i promować artykuł naukowy. Wydawnictwo AmberEditing, Łódź. 2. Siuda P., Wasylczyk P., Publikacje naukowe, 2018. Praktyczny poradnik dla studentów, doktorantów i nie tylko. Wydawnictwo Naukowe PWN, Warszawa. 3. Bieżące publikacje naukowe.
Complementary reading list	1. Hirsch J. E., 2005. An index to quantify an individual's scientific research output. Proc. Nat. Acad, Sci. (PNAS), vol. 102, nr 46, s. 16569-16572. 2. Kozierski P. Kabaciński R., Lis M., Kaczmarek P., 2013. Open Access. Analiza zjawiska z punktu widzenia polskiego naukowca. Wyd. Impuls, Poznań - Kraków. 3. Kulczycki E., 2013. Jak dodać prace do Google Scholar i zwiększyć liczbę cytowani oraz indeks Hirscha? Stowarzyszenie EBIB, Toruń.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	9
Subject	**CONTEMPORARY TRENDS IN SCIENTIFIC DEVELOPMENT**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Maria Siwek-Gapińska
Teachers creating the syllabus	prof. dr hab. inż. Dariusz Boroński prof. dr hab. inż. Maria Siwek-Gapińska dr hab. Anna Sławińska, prof. uczelni dr hab. Joanna Bogucka, prof. uczelni dr hab. Magdalena Stanek, prof. uczelni dr. Mirosław Banaszak dr hab. Aleksandra Górecka - Bruzda dr hab. inż. Maciej Walkowiak, prof. uczelni prof. dr hab. inż. Anna Wenda-Piesik

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
III			15
IV			15
V			15
VI			15

3. PROGRAMME

Workshops	**Semester III** **prof. dr hab. inż. Dariusz Boroński** 1. Autonomous machines – cars, planes, household appliances, and others. 2. Robotisation and automation – applications in industry and medicine. 3. Zero-emission drives – used in cars, planes, sea vessels. 4. Renewable energy sources and their application in the construction of passive technical facilities. 5. Bionics in mechanical engineering. 6. Modern materials and their applications. **7.** 3D printing. **Semester IV** **prof. dr hab. inż. Maria Siwek-Gapińska (koordynator)** 1. Ethology – uses in animal science, research methods (dr hab. Aleksandra Górecka - Bruzda)

	2. Genomics in optimizing animal breeding (prof. dr hab. inż. Maria Siwek-Gapińska). 3. Biological effect of zoo-physiotherapeutic treatments. (dr hab. Joanna Bogucka, prof. uczelni) 4. -*omics* technologies and their use in livestock research. (dr hab. Anna Sławińska, prof. uczelni) 5. Specificity of the animal production market in Poland, specialised animal nutrition. 6. The role of acetyl-CoA in metabolism of selected bioactive compounds. (dr hab. Magdalena Stanek, prof. uczelni) **7.** Market trends as determinants in animal husbandry. (dr Mirosław Banaszak) **Semester V** **dr hab. inż. Maciej Walkowiak, prof. uczelni** 1. 5G and 6G networks 2. Internet of things 3. Artificial intelligence 4. Aeroplane or dugout canoe – continuation of the discussion on cyber security 5. Exploring man and the universe with electromagnetism 6. Human interaction with electromagnetic fields **7.** Electromagnetic compatibility as part of ecology **Semester VI** **prof. dr hab. inż. Anna Wenda-Piesik** 7 meetings, each will discuss different issues of modern trends in engineering and technical sciences and natural sciences on the basis of the latest reports from "Nature" (IF=38) and from "Science" (IF=41), i.e. publishers with the highest influence ratings in science. The subject matter will concern technology, the concept of know-how, in the development of civilisation. The purpose of this course is to track progress, hence the subject matter will be updated every year.

4. DIDACTIC METHODS

multimedia lecture, discussion

5. REQUIREMENTS FOR PASSING

scientific essay, participation in a discussion

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_a	Scope and depth - completeness of cognitive perspective and interconnections (a) allowing revision of existing paradigms – world-wide legacy, including the theoretical basis and general and selected specific issues – relevant to the scientific or artistic discipline at hand
P8S_WG_b	Scope and depth - completeness of cognitive perspective and interconnections

	(b) the main trends in the scientific or artistic disciplines in which the training takes place
P8S_WK_a	Context – conditions, effects a) fundamental issues of the modern civilisation
P8S_WK_b	Context – conditions, effects b) economical, legal, ethical, and other important aspects of scientific activities
ABILITIES: the student is able to	
P8S_UK_c	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (c) initiate debates
SOCIAL SKILLS: the student is ready to	
P8S_KK_a	Assessment – critical approach a) critically assess the achievements in the scientific or artistic discipline concerned
P8S_KK_b	Assessment – critical approach b) critically assess their own contribution to the development of the scientific or artistic discipline concerned

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Discussion	Scientific essay
P8S_WG_a					X	X
P8S_WG_b					X	X
P8S_WK_a					X	X
P8S_WK_b					X	X
P8S_UK_c					X	X
P8S_KK_a					X	X
P8S_KK_b					X	X

8. READING LIST

Primary reading list	**Semester III** **prof. dr hab. inż. Dariusz Boroński** 1. K. T. Chau. Electric Vehicle Machines and Drives: Design, Analysis and Application. Wiley-IEEE Press, 2015. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=edsebk&AN=993140&lang=pl&site=eds-live. 2. Bruce Usher. Renewable Energy: A Primer for the Twenty-First Century. Columbia University Press, 2019. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1946704&lang=pl&site=eds-live. 3. Messner, William C. Autonomous Technologies: Applications That Matter. SAE International, 2014. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1805014&lang=pl&site=eds-live. 4. Herrmann, Andreas, et al. Autonomous Driving: How the Driverless Revolution Will Change the World. Emerald Publishing Limited, 2018. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1579295&lang=pl&site=eds-live. 5. George A Bekey, et al. Robotics: State Of The Art And Future Challenges. Imperial College Press, 2008. EBSCOhost,

	search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=516770&lang=pl&site=eds-live. 6. Zukas, Victoria, and Jonas A. Zukas. An Introduction to 3D Printing. First Edition Design Publishing, 2015. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1003128&lang=pl&site=eds-live. **Semester IV** **prof. dr hab. inż. Maria Siwek-Gapińska** 1. Kaleta T. Zachowanie się zwierząt. Zarys problematyki. 2003. Wydawnictwo SGGW, Warszawa. 2. Preeti A., and Misra G., eds. Omics Approaches, Technologies and Applications: Integrative Approaches for Understanding OMICS Data. Springer, 2019. 3. De Heus: Hulsen, Jan, and Kees Scheepens. Pig Signals: Look, Think and Act. Roodbont, 2006. 4. Pueyo Montesinos G. del.: Rehabilitacja i fizjoterapia w weterynarii. 2017. Elsevier Urban & Partner, Wrocław. 5. Pevsner J., Bioinformatics and functional genomics. 2015. Third edition. Chichester, West Sussex, UK : Wiley-Blackwell 6. Stryer L., Berg J.M, Tymoczo J.L. „Biochemia", 2018. Wyd. Nauk. PWN, Warszawa **Semester V** **dr hab. inż. Maciej Walkowiak, prof. uczelni** 1. Dott Annabel Z.: *Essential Guide to Telecommunication.* Pearson Education (US), 2018 2. Smith Kameron: *Telecommunications Essentials*. Clanrye International, 2019 3. Penttinen Jyrki T. J.: *5G Explained - Security and Deployment of Advanced Mobile Communications*. Wiley, 2019 4. *Smart Grid and Internet of Things*. Second EAI International Conference, SGIoT 2018, Niagara Falls, ON, Canada, July 11, 2018 5. Mohesen Guizani , Hsiao-Hwa Chen , Chonggang Wang: *The Future of Wireless Networks: Architectures, Protocols, and Services (Wireless Networks and Mobile Communications)*. CRC Press, 2015 *6.* Battocletti Joseph H.: *Electromagnetism, Man and the Environment*. Routledge, 2019 7. Clayton R. Paul: *Introduction to Electromagnetic Compatibility*. Wiley-Interscience; 2 edition, 20006 **Semester VI** **prof. dr hab. inż. Anna Wenda-Piesik** Journal Science Journal Nature
Complementary reading list	**Semester III** **prof. dr hab. inż. Dariusz Boroński** - electronic sources available at the UTP Main Library **Semester IV** **prof. dr hab. inż. Maria Siwek-Gapińska** 1. Bockstahler B., Levine D., Millis D.: Fizjoterapia psów i kotów. Rehabilitacja i zwalczanie bólu. 2004. Wyd. Galaktyka 2. Martin P., Bateson P. Measuring behaviour. An introductory guide. 2007. Cambridge University Press. 3. Margit H. Zeitler-Feicht. Zachowania koni. Przyczyny, terapia i profilaktyka. 2014. Świadome Jeździectwo, Warszawa. 4. Cattle behaviour. http://www.publish.csiro.au/ebook/chapter/9781486301614_Chapter4

5. Pig behaviour. https://www.farmhealthonline.com/health-welfare/pigs/pig-behaviour/
6. Animal Behaviour Net. https://www.animalbehaviour.net/
7. Adamczyk K., Górecka-Bruzda A., Nowicki J., Gumułka M., Molik E., Schwarz T., Earley B., Klocek C. 2015 – Perception in farm animals – a review. Annals of Animal Science 15, 565-589.
8. Temple Grandin. Zrozumieć zwierzęta. 2011. Media Rodzina, Poznań.
9. Levine D., Millis D.L., Taylor R.A.: Rehabilitacja psów. 2016. Edra Urban&Partner, Wrocław.
10. Robertson J., Mead A.: Fizjoterapia i masaż psów. 2017 Galaktyka, Łódź.
11. Kinalski R.: Neurofizjologia kliniczna dla neurorehabilitacji. Podręcznik dla studentów i absolwentów wydziałów fizjoterapii. 2008. Med Pharm Polska.
12. Minakowski W., Weidner S., „Biochemia kręgowców", Wyd. Nauk. PWN, Warszawa 2005.
13. Murray R.K., Granner D.K., Mayes P.A., Podwell V.W., „Biochemia Harpera", Wyd. Lek. PZWL, Warszawa 2016
14. Kączkowski J., „Podstawy biochemii", Wyd. Nauk. Techn., Warszawa 2017.
15. Kupcewicz B., Roślewska A., Stanek M., Stasiak K., „Materiały do ćwiczeń i seminariów z biochemii", Wyd. Uczelniane ATR, Bydgoszcz 2005.
16. Strzeżek J., Wołos A., 1997, „Ćwiczenia z biochemii", Wyd. ART Olsztyn
17. https://media.wholefoodsmarket.com/news/whole-foods-market-unveils-top-10-food-trends-for-2019
18. https://www.tysonfoods.com/the-feed-blog/food-trends-2019
19. http://www.mintel.com/global-food-and-drink-trends/
20. http://ptz.icm.edu.pl/wp-content/uploads/2011/12/PH_8_2011_Mlynarczyk.pdf
21. https://www.avec-poultry.eu/resources/annual-reports/
22. https://www.geografia24.eu/geo_prezentacje_rozsz_3/383_3_rolnictwo/r3_3_03a.pdf
23. http://www.fao.org/animal-production/en/

Semester V

dr hab. inż. Maciej Walkowiak, prof. uczelni

Reading list provided on an ongoing basis, during the lessons

Semester VI

prof. dr hab. inż. Anna Wenda-Piesik

Reading list provided on an ongoing basis, during the lessons

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	10
Subject	**ACADEMIC ENTREPRENEURSHIP**
Subject coordinator responsible for creating the syllabus	dr inż. Adam Mroziński
Teachers creating the syllabus	dr inż. Adam Mroziński mgr Piotr Jankowski

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
IV	15		
V	15		

3. PROGRAMME

Lectures	**Semester IV** **dr inż. Adam Mroziński - 10 hours** **mgr Piotr Jankowski - 5 hours** 1. Determinant factors for entrepreneurship in an academic environment. Types and forms of entrepreneurial behaviour at universities. Entrepreneurial universities and entrepreneurial scientists – 3 hours 2. Instruments and systems to support entrepreneurial mindsets at university – 3 hours 3. Determinant factors and forms of knowledge transfer. Relationships between the sphere of science and business. Concepts and rules in the field of industrial property and copyright protection related to the creation of new ventures – 3 hours 4. Commercialisation of research results. Technological entrepreneurship – 3 hours 5. Conditions for the establishment and functioning of academic enterprises. Planning and building a spin off/ spin out project – 3 hours **Semester V** **dr inż. Adam Mroziński - 10 hours** **mgr Piotr Jankowski - 5 hours** 1. Academic entrepreneurship – analysis of Polish and foreign cases – 3 hours 2. Academic entrepreneurship – characteristics of determinant factors for particular groups: students, doctoral students, scientific and technical staff, and teaching and scientific staff – 2 hours 3. Evaluation and analysis methods of knowledge-based business projects – 3 hours 4. Institutions of the university's system supporting academic entrepreneurship and technology commercialisation – 2 hours

	5. Academic entrepreneurship support schemes – 3 hours 6. Effectiveness of instruments of business environment institutions in supporting academic entrepreneurship – 2 hours

4. DIDACTIC METHODS

multimedia presentation, demonstration, discussion, prelection, situational method, informational lecture, conversational lecture, issue-specific lecture

5. REQUIREMENTS FOR PASSING

exam – either written or oral (in case of absence at the final assessment), test, preparation of a commercialisation project

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_d	Scope and depth - completeness of cognitive perspective and interconnections d) rules for dissemination of scientific results, including through open access
P8S_WK_c	Context – conditions, effects c) basic principles for the transfer of knowledge to the economic and social sphere and for the commercialisation of scientific results and know-how relating to those results
ABILITIES: the student is able to	
P8S_UW_c	Utilisation of knowledge – resolving problems and completing tasks c) transfer the results of scientific activities to the economic and social sphere
P8S_UK_b	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language b) disseminate the results of scientific activities, including in popular forms
P8S_UO_a	Work organisation - planning and teamwork a) plan and implement individual and collaborative research or creative projects, including in an international environment
P8S_UU_a	Lifelong learning – planning one's own development and development of others a) plan and act for the benefit of their own development and inspire and organise the development of others
SOCIAL SKILLS: the student is ready to	
P8S_KO_c	Responsibility – fulfilling social obligations and acting in the interest of the public c) think and act in an entrepreneurial manner

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_d			X			
P8S_WK_c			X			
P8S_UW_c			X			
P8S_UK_b			X			
P8S_UO_a				X		
P8S_UU_a				X		
P8S_KO_c				X		

8. READING LIST

Primary reading list	1. Banerski G, Gryzik A., Matusiak K. B., Mażewska M., Stawasz E., „Przedsiębiorczość akademicka (rozwój firm spin-off, spin-out) – zapotrzebowanie na szkolenia służące jej rozwojowi" Research report, Wyd. Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2009 r. - https://www.efs.2007-2013.gov.pl/AnalizyRaportyPodsumowania/baza_projektow_badawczych_efs/Documents/przedsiebiorczosc_akademicka_raport30032011.pdf 2. Barski R., Cook T. „Metodyka identyfikacji projektów do komercjalizacji na wyższych uczelniach", PARP, Warszawa, 2011 - https://www.pi.gov.pl/PARPFiles/file/metodyka_identyfikacji.pdf 3. Santarek K. (red.) „Transfer technologii z uczelni do biznesu", Wyd. Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008 r. - https://www.parp.gov.pl/files/74/81/194/4372.pdf 4. Tamowicz P., Przedsiębiorczość akademicka. Spółki spin-off w Polsce. PARP Warszawa 2006r. - https://www.parp.gov.pl/storage/publications/pdf/1111.pdf
Complementary reading list	1. Wissema J. G., „Technostarterzy - Dlaczego i jak?" Wyd. Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2005. 2. Charnas T. (red.) „Z innowacją w biznes" INFOR Training, Kraków 2010. 3. Trzmielak D., Zehner W., „Metodyka i organizacja doradztwa w zakresie transferu technologii i komercjalizacji wiedzy", PARP, Warszawa, 2011. 4. Kowalczyk I., Pawłowska J., Sarti F., Zago Biasetti I., „Metody inkubacji projektów biznesowych", PARP, Warszawa, 2011. 5. Your Guide to IP Commercialisation - The European IP Helpdesk - https://www.iprhelpdesk.eu/sites/default/files/2018-12/european-ipr-helpdesk-your-guide-to-ip-commercialisation.pdf 6. The role of public support in the commercialisation of innovations – Report - http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_394_en.pdf 7. Gródek-Szostak Z., "Transfer of technology in practice" - http://www.imim.pl/PHD/www.imim-phd.edu.pl/contents/Lectures/GRODEK%20SZOSTAK%20Commercialization%20of%20scientific%20research.pdf

DOCTORAL SCHOOL
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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	11
Subject	**INVENTION TECHNIQUES**
Subject coordinator responsible for creating the syllabus	dr hab. inż. Zdzisław Kucybała, prof. uczelni
Teachers creating the syllabus	dr hab. inż. Zdzisław Kucybała, prof. uczelni dr inż. Ilona Pyszka

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
IV	15		

3. PROGRAMME

Lectures	Innovation (concepts and types). Inventions and patents. Describing an invention. Titling an invention. Determining the technical field of the invention. Determining the technique of the invention. Determining the disclosure of the invention. Beneficial effects of the invention. Explaining the images in the invention. Example of implementation of the invention. Application of the invention. Patent claims. Short description of the invention. Necessary drawings. Selected issues from the procedure of examining applications for inventions and assessing the patentability of the invention. Utility model, industrial design, and trademark. Patent information.

4. DIDACTIC METHODS

discussion, presentation

5. REQUIREMENTS FOR PASSING

presentation

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WK.c	Context – conditions, effects c) basic principles for the transfer of knowledge to the economic and social sphere and for the commercialisation of scientific results and know-how relating to those results
ABILITIES: the student is able to	
P8S_UW.a	Utilisation of knowledge – resolving problems and completing tasks a) utilise knowledge from various scientific or artistic disciplines for creative identification, formulation, and innovative resolution of complex problems, or to complete tasks of research nature, and especially: define purpose and subject of research, formulate a hypothesis, develop research methods, techniques, and tools, and utilise them creatively, or to make deductions on the basis of research results.

P8S_UW.c	Utilisation of knowledge – resolving problems and completing tasks c) transfer the results of scientific activities to the economic and social sphere
SOCIAL SKILLS: the student is ready to	
P8S_KR	Professional role – independence and development of ethos - maintain and develop the ethos of the research community, including: conducting scientific activities in an independent manner

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WK.c				X		
P8S_UW.a				X		
P8S_UW.c				X		
P8S_KR				X		

8. READING LIST

Primary reading list	1. Red. Pyrża A, Warszawa 2017. Poradnik wynalazcy. Urząd Patentowy Rzeczpospolitej Polskiej 2. Oprac. Sychowska H., Warszawa 2017. Teksty ujednolicone podstawowych aktów wykonawczych do ustawy Prawo własności przemysłowej. Urząd Patentowy Rzeczpospolitej Polskiej 3. Oprac. Sychowska H., Warszawa 2016. Prawo własności przemysłowej. Ustawa z dnia 30 czerwca 2000 r. Urząd Patentowy Rzeczpospolitej Polskiej
Complementary reading list	1. Biuletyn Urzędu Patentowego *[Bulletin of the Patent Office]* 2. Wiadomości Urzędu Patentowego *[News of the Patent Office]*

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	12
Subject	**ETHICS IN SCIENCE**
Subject coordinator responsible for creating the syllabus	dr Zofia Zgoda
Teachers creating the syllabus	dr Zofia Zgoda

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
VI	15		

3. PROGRAMME

Lectures	General ethical issues. Peculiarity, functions, and goals of professional ethics – determinant factors. Professional ethics as social roles – conflict of roles. Traditional and contemporary understanding of the university's mission and the ethos of science. The special role of ethics in the pragmatics of scientific life in the 21st century. Ethical neutrality and freedom of science (freedom of scientists) vs the moral responsibility of the researcher, the scientist. The well-established predispositions of the people of science, the reliability of the research apparatus, and the general culture of society as the foundation that constitutes the sense of responsibility of a person and a scientist. Ethics of scientific research. Institutionalisation of ethics in science: Code of Ethics for Research Workers. Good Scientific Research Practice. Good Manners in Science. European Charter for Researchers. Conflicts, ethical dilemmas, fraud, and abuse in modern scientific research. Utilisation of research results as an ethical problem. Ethics in the face of the civilisational challenges and the threats arising from new forms of organisation and financing of research.

4. DIDACTIC METHODS

multimedia lecture, discussion

5. REQUIREMENTS FOR PASSING

oral exam, participation in discussion

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WK_b	Context – conditions, effects b) economical, legal, ethical, and other important aspects of scientific activities
ABILITIES: the student is able to	
P8S_UU_a	Lifelong learning – planning one's own development and development of others

	a) plan and act for the benefit of their own development and inspire and organise the development of others
SOCIAL SKILLS: the student is ready to	
P8S_KO_a	Responsibility – fulfilling social obligations and acting in the interest of the public Be responsible for fulfilling the social obligations of researchers and creators.
P8S_KO_b	Responsibility – fulfilling social obligations and acting in the interest of the public b) initiate actions in the public interest
P8S_KO_c	Responsibility – fulfilling social obligations and acting in the interest of the public c) think and act in an entrepreneurial manner
P8S_KR	Professional role – independence and development of ethos maintain and develop the ethos of the research community, including: conducting scientific activities in an independent manner

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Discussion	Test	Presentation	Project	Report
P8S_WK_b	X	X				
P8S_UU_a		X				
P8S_KO_a		X				
P8S_KO_b		X				
P8S_KO_c		X				
P8S_KR		X				

8. READING LIST

Primary reading list	1. Chmielecka E., Jedlicki J., Rychard A. (red), 2005, Tytuł. Ideały nauki i konflikty wartości, IFiS PAN, Warszawa. 2. Galewicz Wł., 2009, Etyczne i prawne granice badań naukowych, Uniwersitas Kraków. 1. Morawski R. Z., 2011, Etyczne aspekty działalności badawczej w naukach empirycznych, Wydawnictwo UW warszawa.
Complementary reading list	1. Kodeks Etyki Pracownika Naukowego, 2017, Komisja Do Spraw Etyki W Nauce PAN, Warszawa. 1. Dobra Praktyka Badań Naukowych, Rekomendacje, 2004, Warszawa.

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	13
Subject	**TEACHING MODULE**
Subject coordinator responsible for creating the syllabus	dr Anna Michalska
Teachers creating the syllabus	Psychology dr Anna Michalska Teaching at institutions of higher education dr Hanna Laskowska Higher education didactics with elements of methodology dr Magdalena Zając

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
V	30		
VI	30		
VII	15		
VIII	15		

3. PROGRAMME

Lectures	**Semester V** **Psychology** **dr Anna Michalska** Basic history of psychology: elementary concepts, psychological schools of thought. The group and the laws that govern it. Perceptual processes: thinking, memory, attention, learning. Motivation. Emotions. Addictions: alcohol, psychoactive agents. All the mentioned issues will be discussed in the context of working with students and other professional and scientific work. **Semester VI** **Teaching at institutions of higher education** **dr Hanna Laskowska** Pedagogy and its scientific status. Andragogy as a discipline of general pedagogy. Educational processes as a subject of pedagogical research. The human problem (teacher, educator) in the transition from a "culture of objectification" of a person to a "culture of subjects". Education in the light of J. Bruner's theory of education, Gardner's theory of multiple intelligences, and Goleman's emotional intelligence theory. Contemporary trends and pedagogical tendencies. Purposes and methods

	of education. Multicultural development of Polish and global pedagogy. Differentiation, disintegration, and reintegration in pedagogy. Selected trends in pedagogy of the first half of the 20th century. Selected trends in pedagogy of the second half of the 20th century (critical, anti-authoritarian, emancipatory, intercultural, ecological, negative pedagogy, postmodern pedagogy). Openness to new methods in innovative didactics: coaching in education, tutoring (new teacher-student relations), design thinking (utilising human creative potential in the process of designing new solutions in education), FRIS styles of thinking and acting. Principles and methods of adult education and self-education. **Semesters VII and VIII** **Higher education didactics with elements of methodology** **dr Magdalena Zając** Higher education didactics as a field of science. Its essence, issues and functions, and its place among other pedagogical sciences. Contemporary student – characteristics of generation Z. Characteristics of early adulthood period: (theories: D. Levinson, R. Gould, E. Erikson). Young adults – psychophysical, cognitive, social, emotional and moral development; regularities and determinant factors of the learning process from adolescence to early adulthood, forms of adult activities. Expanding autonomy and self-reliance. Socialisation and social position in the student group. The role of significant persons and authorities - teacher's authority. Ambitions and aspirations. Motivation. Specificity and regularity of learning of young adults. Cognitive styles and learning strategies versus higher education teaching methods. Modern academic teacher. Qualifications, competences, and role of the academic teacher. Student-teacher interactions during lessons. Dynamics of a student group: cooperation and collaboration of students. Stimulating student cognitive activity, creating didactic situations, managing student work. Teaching methods – classification, selection criteria. Formulating goals and learning outcomes. Operationalisation of educational goals. Assessment and self-assessment in the didactic work of an academic teacher: didactic measurement at the academic level of education – principles of preparing tests, testing the level of student's competence. Teaching methods and means – use in particular forms of lessons in undergraduate and postgraduate programmes.

4. DIDACTIC METHODS

lecture, discussion, situational method, didactic exercises, Oxford-style debate

5. REQUIREMENTS FOR PASSING

oral exam

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WK_c	Context – conditions, effects c) basic principles for the transfer of knowledge to the economic and social sphere and for the commercialisation of scientific results and know-how relating to those results
ABILITIES: the student is able to	

P8S_UU_a	Lifelong learning – planning one's own development and development of others a) plan and act for the benefit of their own development and inspire and organise the development of others
P8S_UU_b	Lifelong learning – planning one's own development and development of others b) plan classes or groups of classes and implement them using modern methods and tools
SOCIAL SKILLS: the student is ready to	
P8S_KK_c	Assessment – critical approach c) recognise the importance of knowledge in solving cognitive and practical problems

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WK_c	X					
P8S_UU_a	X					
P8S_UU_b	X					
P8S_KK_c	X					

8. READING LIST

Primary reading list

Semester V
Psychology
dr Anna Michalska

1. Zaręba J., 2018, Krótka historia psychologii, Wydawnictwo RM, Warszawa.
2. Terelak J. F., 1999. Psychologia menedżera, Difin, Warszawa.
3. Tomaszewski T., (red.), 1992. Psychologia ogólna, Wydawnictwo Naukowe PWN, Warszawa.

Semester VI
Teaching at institutions of higher education
dr Hanna Laskowska

1. Kwieciński Z.,Śliwierski B., (red.),(2019), Pedagogika tom 1, PWN Warszawa.
2. Hejnicka- Bezwińska T., (2000), O zmianach w edukacji, Bydgoszcz.
3. Gardner H.,(2002), Inteligencje wielorakie. Teoria w praktyce. Przeł. A. Jankowska, Poznań.

Semesters VII and VIII
Higher education didactics with elements of methodology
dr Magdalena Zając

1. Brzezińska A., Brzeziński J., Ewaluacja procesu kształcenia w szkole wyższej, Poznań, 2000.
2. Jaskot H.W. (red.), Wprowadzenie do pedagogiki szkoły wyższej, Szczecin 2006.
3. Schrade U., (red.), Dydaktyka szkoły wyższej. Wybrane problemy, Publisher: OWPW, 2010.

Complementary reading list	**Semester V** **Psychology** **dr Anna Michalska** 1. Caldini, R., 2007, Wywieranie wpływu na ludzi, GWP, Gdańsk. **Semester VI** **Teaching at institutions of higher education** **Dr Hanna Laskowska** 1. Kwieciński Z., (2000), Alternatywy myślenia o/dla edukacji, Warszawa. 2. Hejnicka- Bezwińska T., (2008), Pedagogika ogólna- Pedagogika wobec współczesności, Warszawa. 3. Brown B., (2012), Dary niedoskonałości, czyli wrzuć na luz. Przeł. K. Puławski, Poznań. **Semesters VII and VIII** **Higher education didactics with elements of methodology** **dr Magdalena Zając** 1. Fenstermacher G., Soltis J., Style nauczania, Warszawa 2000 2. Gagne, R.M., Briggis, L.J., Wager, W.W. (1992). Zasady projektowania dydaktycznego. 3. Szewczuk K., Metody dydaktyczne stosowane w szkole wyższej, Kraków 2013

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	14
Subject	**INTERNSHIP**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Dariusz Skibicki
Teachers creating the syllabus	prof. dr hab. inż. Dariusz Skibicki

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
VII			30
VIII			30

3. PROGRAMME

Workshops	Participation in teaching or unassisted teaching at the UTP University of Science and Technology.

4. DIDACTIC METHODS

Participation in teaching or unassisted teaching

5. REQUIREMENTS FOR PASSING

Assessment by an inspector, an academic teacher of the organisation unit that commissioned the teaching.

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
ABILITIES: the student is able to	
P8S_UK_c	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (c) initiate debates
P8S_UO_a	Work organisation - planning and teamwork (a) plan and implement individual and collaborative research or creative projects, including in an international environment
P8S_UU_a	Lifelong learning – planning one's own development and development of others a) plan and act for the benefit of their own development and inspire and organise the development of others
P8S_UU_b	Lifelong learning – planning one's own development and development of others b) plan classes or groups of classes and implement them using modern methods and tools
SOCIAL SKILLS: the student is ready to	

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Inspection
P8S_UK_c						X
P8S_UO_a						X
P8S_UU_a						X
P8S_UU_b						X

8. READING LIST

Primary reading list	N/A
Complementary reading list	N/A

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SYLLABUS

1. INFORMATION ABOUT THE SUBJECT

Subject number	15
Subject	**DISSERTATION WORKSHOP**
Subject coordinator responsible for creating the syllabus	prof. dr hab. inż. Dariusz Skibicki
Teachers creating the syllabus	Engineering and technical sciences prof. dr hab. inż. Janusz Sempruch prof. dr hab. inż. Dariusz Skibicki prof. dr hab. inż. Dariusz Boroński Natural sciences prof. dr hab. inż. Maria Siwek-Gapińska dr hab. inż. Anna Sławińska, prof. uczelni

2. DISTRIBUTION OF HOURS BETWEEN THE SEMESTERS

Semester	Lectures	Laboratory	Workshops
I			15
II			15*
III			15*
IV			15*
V			15*
VI			15*
VII			30*
VIII			30*
I	30		
II	30*		

*subject implemented separately in a discipline or group of disciplines

3. PROGRAMME

Lectures	**Semester I** **Doctoral school and doctoral dissertation** The Doctoral School Regulations; Curriculum of the Doctoral School; Scientific disciplines and scientific degrees and titles; Doctoral dissertation: statutory requirements, structure of the dissertation, analysis of examples of dissertations; Review of a doctoral dissertation; Defending the doctoral dissertation; Characteristics of the Personal Research Plan; Assessment of the scientific achievements of an academic staff member; **Semester II** **Developing a Personal Research Plan**

	The doctoral students present their propositions for their own Personal Research Plan. The doctoral students familiarise themselves with the Terms and conditions of conduct in promotion to the degree of a doctor or refusal to promote to the degree of a doctor at the UTP university; as well as with the Code of the National Science Centre on Research Integrity and Applying for Research Financing. Further workshops: review, unassisted preparation, and discussion regarding the particular elements of the Personal Research Plan, in the following order: scientific article publication; scientific internship; dissertation title, research problem or hypothesis; expected results, contribution to the development of the discipline. Presentation of compete Personal Research Plans related to the topic at hand by the individual Doctoral Students, making comments and suggestions. **Semester III** **Characteristics of the scientific supervisor** The doctoral students specify the characteristics of the scientific profile of a dissertation supervisor, including their scope of scientific interest, academic background, bibliometric indicators. Examples of career paths of the world's best scientists, scientometric tools; developing a scientific profile on dedicated social media (e.g. EURAXESS); developing a scientific bio; harmonious and conscious development of a scientific career The doctoral students specify the characteristics of a scientific institutions at which their supervisor is employed, e.g. scientific profile of the institution, its research facilities: machines, devices, software, and the extent to which they cooperate with the economic environment. **Semester IV** **Preparation for the mid-term assessment** The doctoral students prepare and present their report and their presentation for the mid-term assessment. Moreover, the doctoral students familiarise themselves with the European Charter for Researchers: the code of conduct for the recruitment of researchers (logo: HR Excellence in Research). The doctoral students familiarise themselves with the elements of ethics and responsibility utilised in scientific research, including e.g. ethical planning, realising, and publishing research results. The doctoral students resolve issues regarding copyrights, conflicts of interest, and responsibility in realising research by multiple authors. **Semester V** **Literature studies** The doctoral students present the results of their literature studies regarding the subject matter of their doctoral dissertation. On that basis, the student is able to determine the primary scientific trends in their scientific discipline of choice and use this background to indicate the position of their researched subject matter. The student is able to identify the most influential journals in their discipline. **Semester VI** **Description of the research toolset** The doctoral students present their research toolset: research facility, measuring tools, utilised software, utilised research methods, utilised data analysis methods,

	etc. Particular attention is paid to the design and execution of the elements of the research toolset. **Semester VII** **Presentation of own research results** The doctoral students present the results of their own research. They scrutinise the results and draw inferences. **Semester VIII** **First-person narrative summary of the thesis** The doctoral student presents their thesis from the first-person perspective, which they have prepared for the defence of their doctoral dissertation.

4. DIDACTIC METHODS

Presentations, discussion

5. REQUIREMENTS FOR PASSING

Presentations

6. LEARNING OUTCOMES SPECIFIC TO THIS SUBJECT

Learning outcomes reference	Learning outcomes description
KNOWLEDGE: the student knows and understands	
P8S_WG_b	Scope and depth - completeness of cognitive perspective and interconnections (b) the main trends in the scientific or artistic disciplines in which the training takes place
P8S_WG_d	Scope and depth - completeness of cognitive perspective and interconnections d) rules for dissemination of scientific results, including through open access
ABILITIES: the student is able to	
P8S_UK_a	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (a) communicate on specialised topics to a degree which allows for active participation in an international scientific community
P8S_UK_c	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (c) initiate debates
P8S_UK_d	Communication – understanding and expressing statements, disseminating knowledge in the scientific community, and using a foreign language (d) participate in the scientific discourse
P8S_UU_a	Lifelong learning – planning one's own development and development of others a) plan and act for the benefit of their own development and inspire and organise the development of others
P8S_UU_b	Lifelong learning – planning one's own development and development of others b) plan classes or groups of classes and implement them using modern methods and tools
SOCIAL SKILLS: the student is ready to	
P8S_KK_a	Assessment – critical approach a) critically assess the achievements in the scientific or artistic discipline concerned
P8S_KK_b	Assessment – critical approach b) critically assess their own contribution to the development of the scientific or artistic discipline concerned

P8S_KK_c	Assessment – critical approach c) recognise the importance of knowledge in solving cognitive and practical problems
P8S_KR	Professional role – independence and development of ethos - maintain and develop the ethos of the research community, including: conducting scientific activities in an independent manner

7. MEANS OF TESTING THE ATTAINMENT OF THE LEARNING OUTCOMES

Learning outcomes	Means of testing					
	Oral exam	Written exam	Test	Presentation	Project	Report
P8S_WG_b				X		
P8S_WG_d				X		
P8S_UK_a				X		
P8S_UK_c				X		
P8S_UK_d				X		
P8S_UU_a				X		
P8S_UU_b				X		
P8S_KK_a				X		
P8S_KK_b				X		
P8S_KK_c				X		
P8S_KR_a				X		

8. READING LIST

Primary reading list	1. The Code of the National Science Centre on Research Integrity and Applying for Research Financing. National Centre of Science, 2016. 2. European Charter for Researchers: the code of conduct for the recruitment of researchers. European Commission, 2006 3. Steneck, Nicholas H. ORI introduction to the responsible conduct of research. Government Printing Office, 2007. 4. Regulations of the Doctoral School 5. Act of 20 July 2018 – The Law on Higher Education and Science
Complementary reading list	1. Patience, Gregory S., et al. "Intellectual contributions meriting authorship: Survey results from the top cited authors across all science categories." PLoS One 14.1 (2019): e0198117. 2. Van Noorden, Richard. "Online collaboration: Scientists and the social network." Nature news 512.7513 (2014): 126.