COURSE SYLLABUS

Course title: **METHODOLOGY OF SCIENTIFIC RESEARCH**	Credit value: **6**
Course responsible and lecturer: **Prof. Dr. Andrea Tick**	
Course classification: **Basic course (subjects) in the field of safety and security science**/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": **50% theory - 50% practice**	
Type of class: **lecture** / seminar / practice / **consultation** Total number of classes in the given semester: **30 classes** – Methods and (specific) approaches, characteristics used to deliver the course content: theoretical lectures – case presentations – project work – individual projects	
Form of assessment: **exam** / practical grade / other Additional (specific) methods of knowledge assessment: **written assignments**, **scientific research plan**, **research report**	
Curricular placement of the course: Can be taken in **semesters 1–4**	
Prerequisites: None	
Course description:	
The course aims to familiarize students with scientific research methods, the main groups of methods, and the procedures and methods used in the scientific research process (formulating scientific problems, research design, research plan, formulating research questions, probes and hypotheses, literature review, source management). The course also aims to help students learn about and understand new methods and procedures emerging in the field. The course concentrates on ethical behaviour in research procedures including the use and application of artificial intelligence. By completing the course, the students will be: – Familiar with general, specific, and unique methods of scientific research. – Capable to apply basic and developmental research.	

– Familiar with the most common empirical methods, types of logical methods, and the most important mathematical research methods. – able to apply basic procedures and practices used in the research process.
Required readings (textbooks, study materials):
Saunders, M. N. K., Lewis, P., & Thornhill, A. (2023). Research methods for business students (Ninth edition). Pearson. ISBN: 978-1-292-40274-1 Pearson. (2023). Student Resources | Saunders, Thornhill, Lewis, Research Methods for Business Students, 9/e. https://media.pearsoncmg.com/intl/ema/ema_uk_he_saunders_resmeths_9/cw/index.php Thiel, D. V. (2014). Research Methods for Engineers (1st ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139542326, ISBN: 978-1-107-03488-4
Recommended readings (textbooks, study materials):
Li, F., Du, W. W., Li, R. Q., & Wang, Z. S. (2018). Seven Sections Research Method Based on Engineering. J. Phys. Conf. Ser., 1087(4). https://doi.org/10.1088/1742-6596/1087/4/042027 Li, J., Qiu, Y., Wei, F. Y., & Jiang, R. S. (2014). Research on conceptual design selection based on engineering science. Adv. Mater. Res., 1056, 186–189. https://doi.org/10.4028/www.scientific.net/AMR.1056.186 Novikov, A. M., & Novikov, D. A. (2013). Research methodology: From philosophy of science to research design. CRC Press. ISBN: 978-0-203-76472-5 Rincon Soto, I. B., Soledispa-Cañarte, B. J., Sumba-Bustamante, R. V., del Carmen Burbano-Gómez, Z., & Jiménez-Granizo, F. P. (2023). Methodological Approaches and Paradigms in Scientific Aand technological Research: A Bibliometric Review. Bibliotecas, Anales de Investigacion, 19(1), 50–60. Susilawati, A., Al Obaidi, A. Sh. M., Abduh, A., Irwansyah, F. S., & Nandiyanto, A. B. D. (2025). How to do research methodology: From Literature Review, Bibliometric, Step-by-step Research Stages, to Practical Examples in Science and Engineering Education. Indonesian Journal of Science and Technology, 10(1), 1–40. https://doi.org/10.17509/ijost.v10i1.78637

Date: 29 September 2025

Prepared by: PROF. DR. ANDREA TICK

COURSE SYLLABUS

Course title: **Physical Protection Systems**	Credit value: **6**
Course responsible and lecturer: **Dr. Őszi Arnold**	
Course classification: **Basic course (subjects) in the field of safety and security science**/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": **50% theory - 50% practice**	
Type of class: lecture / seminar / practice / **consultation** Total number of classes in the given semester: **30 classes** Methods and (specific) approaches, characteristics used to deliver the course content: Lectures, consultations, case presentations, and case study analyses.	
Form of assessment: exam / **practical grade** / other Additional (specific) methods of knowledge assessment: Individual student work	
Curricular placement of the course: Can be taken in **semesters 1–4**	
Prerequisites: None	
Course description:	
The course provides students with knowledge of physical protection systems, including architectural design options for security, intrusion detection systems, fire alarm systems, CCTV surveillance, and access control systems. These protective elements are undergoing significant transformation today, with increasing effectiveness and complexity in modern integrated security solutions.	
Required readings (textbooks, study materials):	
Diana, L.; Dini, P.; Paolini, D. Overview on Intrusion Detection Systems for Computers Networking Security. Computers 2025, 14, 87. https://doi.org/10.3390/computers14030087 Camalapuram Subramanyam, S.; Bhattacharya, A.; Sinha, K. Secure and Efficient Video Management: A Novel Framework for CCTV Surveillance Systems. IoT 2025, 6, 38. https://doi.org/10.3390/iot6030038	

Gartner, C.; Mathew, J.K.; Bullock, D. Methodology for Automatically Detecting Pan–Tilt–Zoom CCTV Camera Drift in Advanced Traffic Management System Networks. Future Transp. 2024, 4, 1297-1317. https://doi.org/10.3390/futuretransp4040062

Radovan, A.; Mršić, L.; Đambić, G.; Mihaljević, B. A Review of Passenger Counting in Public Transport Concepts with Solution Proposal Based on Image Processing and Machine Learning. Eng 2024, 5, 3284-3315. https://doi.org/10.3390/eng5040172

Recommended readings (textbooks, study materials):

Sabit, H. Artifical Intelligence-Based Smart Security System Using Internet of Things for Smart Home Applications. Electronics 2025, 14, 608. https://doi.org/10.3390/electronics14030608

Vardakis, G.; Hatzivasilis, G.; Koutsaki, E.; Papadakis, N. Review of Smart-Home Security Using the Internet of Things. Electronics 2024, 13, 3343. https://doi.org/10.3390/electronics13163343

Ogunseyi, T.B.; Thiyagarajan, G. An Explainable LSTM-Based Intrusion Detection System Optimized by Firefly Algorithm for IoT Networks. Sensors 2025, 25, 2288. https://doi.org/10.3390/s25072288

Wang, G.; Yan, Q. A Method for Improving the Robustness of Intrusion Detection Systems Based on Auxiliary Adversarial Training Wasserstein Generative Adversarial Networks. Electronics 2025, 14, 2171. https://doi.org/10.3390/electronics14112171

Date: 2025.08.15.

Prepared by: Dr. Őszi Arnold

COURSE SYLLABUS

Course title: **PUBLICATION STANDARDS, KNOWLEDGE**	Credit value: **6**
Course responsible and lecturer: **Prof. Dr. Zoltan RAJNAI**	
Course classification: **Basic course (subjects) in the field of safety and security science**/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": **50% theory - 50% practice**	
Type of class: **lecture** / seminar / **practice** / consultation Total number of classes in the given semester: **30 classes** Methods and (specific) approaches, characteristics used to deliver the course content: The main goal of the course is to arouse the interest of students during the interactive presentation and to deepen their knowledge, thereby providing an opportunity to successfully fulfill publication requirements. During the learning process, doctoral students produce research materials and apply the acquired publication standards and knowledge.	
Form of assessment: exam / **practical grade** / other Preparing a publication during the semester, which can be linked to the research planned in the individual research plan, and there is a further opportunity to incorporate it into the doctoral dissertation, focusing on the relationship between hypotheses and security science.	
Curricular placement of the course: Can be taken in **semesters 1–4**	
Prerequisites: None	
Course description:	
The course aims to familiarize students with scientific research methods, the main groups of methods, and the procedures and methods used in the scientific research process (formulating scientific problems, research design, research plan, formulating research questions, probes and hypotheses, literature review, source management). • Reference system	

- Correct use of abbreviations
- Determination of applicable research methods and hypotheses
- Practice of summarizing scientific results
- Preparation and holding presentations of conferences on one's own field of research

Required readings (textbooks, study materials):

MSz ISO 690 standard
IEEE Publication Standards
Chao Wu et al.: Glimpse of safety science development in China: A review of safety fundamental research and construction of six new postgraduate courses for safety majors by safety & security theory innovation and promotion Center of Central South University Safety Science 169 (2024) 15–20. 106323
Yaqoob Raheemy et al.: What is safety? contemporary definitions and interpretations across North America. Safety Science 185 (2025) 106798, https://doi.org/10.1016/j.ssci.2025.106798

Recommended readings (textbooks, study materials):

Corinne Bieder: Safety science: A situated science: An exploration through the lens of Safety Management Systems. Safety Science 135 (2021) 105063. https://doi.org/10.1016/j.ssci.2020.105063
Dr. Csutorás Gábor: Biztonságtudomány. Pannon Egyetem Környezetmérnöki Intézet.
Terje Aven: What is safety scinece? Safety Science 67 (2014) 15–20. https://doi.org/10.1016/j.ssci.2013.07.026
Ji Ge et al.: The main challenges of safety science. Safety Science 118 (2019) 119–125. https://doi.org/10.1016/j.ssci.2019.05.006

Date: 29 September 2025

Prepared by: PROF. DR. ZOLTAN RAJNAI

COURSE SYLLABUS

Course title: **Risk assessment with probabilistic methods**	Credit value: **6**
Course responsible and lecturer: **Dr. habil László Hanka PhD**	
Course classification: **Basic course (subjects) in the field of safety and security science**/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": **50% theory - 50% practice**	
Type of class: **lecture** / **seminar** / practice / consultation Total number of classes in the given semester: **30 classes** Methods and (specific) approaches, characteristics used to deliver the course content: - project work - processing data - application of Excel for data processing - application of Matlab for calculations - presenting running codes - creating Simulink simulation - case study analyses,	
Form of assessment: **exam** / practical grade / other Additional (specific) methods of knowledge assessment: Presenting mathematical models, using Excel, Matlab codes, Simulink simulation	
Curricular placement of the course: Can be taken in **semesters 1–4**	
Prerequisites: None	
Course description:	
– mathematical concept of risk, assessing risk using mathematical methods – learning tools of probability theory and mathematical statistics for assessing the risk – one- and multidimensional distributions, Bayesian probability, prior and posterior distributions	

– tools of mathematical statistics, estimation theory, confidence intervals, hypothesis testing, goodness of fit tests, etc.
Required readings (textbooks, study materials):
Veerarajan: Probability, Statistics and Random processes. McGraw-Hill. 2008. ISBN: 978-0-07-066925-3. Spiegel-Schiller-Srinivasan: Probability and Statistics. McGraw-Hill. 2009. ISBN: 978-0-07-154426-9. Ross: Introduction to probability models. Academic press. 2010. ISBN: 978-0-12-375686-2.
Recommended readings (textbooks, study materials):
Environmental Protection Agency: Risk assessment forum, Probabilistic risk assessment methods and Case studies. USA, 2014. Simmons: Understanding risk: Risk assessment methodologies and examples. European Commission, Risk Management Knowledge Center, 2018 https://drmkc.jrc.ec.europa.eu/portals/0/Knowledge/ScienceforDRM/ch02.pdf.

Date: 01.09.2025.

Prepared by: Dr. habil László Hanka

COURSE SYLLABUS

Course title: **The place and role of security science in the system of sciences**	Credit value: **6**
Course responsible and lecturer: **Prof. Dr. Zoltán Rajnai**	
Course classification: **Basic course (subjects) in the field of safety and security science**/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": **70% theory - 30% practice**	
Type of class: **lecture** / seminar / practice / consultation Total number of classes in the given semester: **30 lessons** Methods and (specific) approaches, characteristics used to deliver the course content: During the interactive lecture, our goal is to spark students' interest and familiarise them with the relevant field of science and discipline. Throughout the learning process, doctoral students prepare research materials, bringing their own specific research areas and safety and security science together as closely as possible.	
Form of assessment: **exam** / practical grade / other Additional (specific) methods of knowledge assessment: **Two papers are to be submitted** during the semester. These can be linked to the research outlined in your individual research plan and may be incorporated into your doctoral dissertation later on. The papers should focus on the relationship between hypotheses and safety and security science.	
Curricular placement of the course: Can be taken in **semesters 1–4**	
Prerequisites: None	
Course description:	
The concept of security and the role of security science within it. The complexity of the fields of security science and their connection to other sciences and scientific fields. Security science has emerged in many areas of everyday life, and there has been a growing demand for increased security and protection of assets and property (both intellectual and material) in recent decades. Security science focuses on taking a scientific approach to issues related to	

property, fire, occupational and personal protection. Security science is a complex field that can only be properly understood with an appropriate scientific foundation, as it is linked to numerous other disciplines and fields of science. At the same time, it encompasses many research topics as an independent field of science.

Applicable methods and methodological concepts of research: Exploratory work and examination of related fields of science. Analysis of the conceptual system of security science; comparisons; clarification of relationships. Development and creation of new concepts with changing times and conditions. Analysis of existing relationships and relationship systems found in the subfields of security science. Research and presentation of new possibilities.

Required readings (textbooks, study materials):

Prof. Dr. Lajos Berek, László Berek, Prof. Dr. Zoltán Rajnai: A tudományos kutatás folyamata és módszerei. Óbudai Egyetem, Budapest, 2022, ISBN 978-963-449-259-7.

Chao Wu et al.: Glimpse of safety science development in China: A review of safety fundamental research and construction of six new postgraduate courses for safety majors by safety & security theory innovation and promotion Center of Central South University Safety Science 169 (2024) 15–20. 106323

Yaqoob Raheemy et al.: What is safety? contemporary definitions and interpretations across North America. Safety Science 185 (2025) 106798, https://doi.org/10.1016/j.ssci.2025.106798

Recommended readings (textbooks, study materials):

Corinne Bieder: Safety science: A situated science: An exploration through the lens of Safety Management Systems. Safety Science 135 (2021) 105063. https://doi.org/10.1016/j.ssci.2020.105063

Dr. Gábor Csutorás: Biztonságtudomány. Pannon Egyetem Környezetmérnöki Intézet.

Terje Aven: What is safety scinece? Safety Science 67 (2014) 15–20. https://doi.org/10.1016/j.ssci.2013.07.026

Ji Ge et al.: The main challenges of safety science. Safety Science 118 (2019) 119–125. https://doi.org/10.1016/j.ssci.2019.05.006

Date: 11.09.2025.

Prepared by: Prof. Dr. Zoltán Rajnai