Areas of security technology and their network
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

Course title: **Areas of security technology and their network**	Credit value: 6
Course responsible and lecturer (name, academic title): Prof. Em. Dr. Berek Lajos László Ph.D.	
Course classification: <u>Basic course (subjects) in the field of safety and security</u> <u>science</u>/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": 60% - 40.% theory - practice	
Type of class: lecture / seminar / practice / consultation and total number of classes in the given semester: 30 classes **Methods and (specific) approaches, characteristics used to deliver the course content:** e.g. case presentations and case study analyses, project work, others... Lecture using the frontal method, seminar discussing pre-assigned questions with my supervisor.	
Form of assessment (exam / practical grade / other): exam grade Additional (specific) methods of knowledge assessment: The evaluation consists of two parts: firstly, the discussion of the given questions in the seminar, and secondly, the evaluation of a scientific article or conference presentation prepared for the subject.	
Curricular placement of the course (which semester): Can be taken in semesters 1–4	
Prerequisites (if any): (*typically there are none!*) -	
Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired	
•The concept of safety, the place of safety technology in the conceptual system of safety. • The place of safety technology science and safety science in the system of sciences, their relationship. • The areas of safety technology, the complexity of safety technology, its connection to other sciences and fields of science.	
2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):	
- Dr. Berek Lajos: Biztonságtechnika, NKE, Budapest, 2014. http://vtki.uninke.hu/uploads/media_items/biztonsagtechnika.original.pdf - Dr. Berek Lajos, Dr. Berek Tamás, Berek László: Személy- és vagyonbiztonság, Óbudai Egyetem, Budapest, 2016. ISBN 978-615-5460-94-4	
2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):	

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Areas of security technology and their network
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

- Tóth Attila-Tóth Levente: Biztonságtechnika, NKE, Budapest, 2014. ISBN 978-615-5305-56-6
- Christián L,-Major L,- Szabó Cs [szerk.]: Biztonsági vezetői kézikönyv, Ludovika Egyetemi Kiadó, Budapest, 2020. ISBN 978-963-5310-70-8.

Date: 12. september 2025

Prepared by:

Dr. Berek Lajos

Course title: **Object protection**	Credit value: 6
Course responsible and lecturer (name, academic title): Prof. Em. Dr. Berek Lajos László Ph.D.	
Course classification: <u>Basic course (subjects)</u> in the field of safety and security science/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": 60% - 40.% theory - practice	
Type of class: lecture / seminar / practice / consultation and total number of classes in the given semester: 30 classes **Methods and (specific) approaches, characteristics used to deliver the course content:** e.g. case presentations and case study analyses, project work, others... Lecture using the frontal method, seminar discussing pre-assigned questions with my supervisor.	
Form of assessment (exam / practical grade / other): exam grade Additional (specific) methods of knowledge assessment: The evaluation consists of two parts: firstly, the discussion of the given questions in the seminar, and secondly, the evaluation of a scientific article or conference presentation prepared for the subject.	
Curricular placement of the course (which semester): Can be taken in semesters 1–4	
Prerequisites (if any): (*typically there are none!*) -	
Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired	

• The concept of an object, its main types, and their characteristics.
    • The place of object security in property protection.
    • Guarding and protecting objects.
    • The complexity of guarding and protecting.
    • Mechanical protection of objects, the applied electronic signaling systems, the place and role of manpower in complex guarding and protecting.	

2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):	
- Dr. Berek Lajos: Biztonságtechnika, NKE, Budapest, 2014. http://vtki.uninke.hu/uploads/media_items/biztonsagtechnika.original.pdf - Dr. Berek Lajos, Dr. Berek Tamás, Berek László: Személy- és vagyonbiztonság, Óbudai Egyetem, Budapest, 2016. ISBN 978-615-5460-94-4	
2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):	

- Tóth Attila-Tóth Levente: Biztonságtechnika, NKE, Budapest, 2014. ISBN 978-615-5305-56-6
- Christián L,-Major L,- Szabó Cs [szerk.]: Biztonsági vezetői kézikönyv, Ludovika Egyetemi Kiadó, Budapest, 2020. ISBN 978-963-5310-70-8.
- Horváth T. : Mechanikai védelem, mint késleltetés a fizikai védelemben, NKE Budapest, 2021 In. Hadmérnök p 23–32. ISSN 1788-1919 (online) https://doi.org/10.32567/hm.2021.1.2
- Szabó Lajos: Az objektumok biztonsága és az objektumvédelem speciális területe a megelőző védelem, PhD értekezés, ÓE BDI 2021. https://oda.uni-obuda.hu/bitstream/handle/20.500.14044/10329/Szabo_Lajos_ertekezes.pdf?sequence=1&isAllowed=y

Date: 12. september 2025

Prepared by:

Dr. Berek Lajos

Course title: **Physical Protection Systems**	Credit value: 6
Course responsible and lecturer (name, academic title): Dr. Őszi Arnold	
Course classification: <u>Basic course (subjects) in the field of safety and security science</u>/ Research topic related basic course / Optional subject	
Proportion of theoretical and practical content, "Training character": 50 % - 50 % theory - practice	
Type of class: lecture / seminar / practice / <u>consultation</u> and 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 / <u>practical grade</u> / other): exam grade Additional (specific) methods of knowledge assessment: Individual student work	
Curricular placement of the course (which semester): Can be taken in semesters 1–4	
Prerequisites (if any): none	
Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired	
- 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.	
2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):	
- 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	

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TRADITION AND INNOVATION

Physical Protection Systems
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):

- 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

Publication standards, knowledge
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

Course title: **Publication standards, knowledge**	Credit value: 6

Course responsible and lecturer (name, academic title): 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 % - 50 % theory - practice

Type of class: lecture / seminar / **practice** / consultation and 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): exam 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 (which semester): Can be taken in semesters 1–4

Prerequisites (if any): **-**

Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired - 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). Publikációs szabványok ismertetése • 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

2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN): — MSz ISO 690 standard — IEEE Publication Standards

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Publication standards, knowledge
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

— 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

2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):

- 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

Risk assessment with probabilistic methods
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

Course title: **Risk assessment with probabilistic methods**	Credit value: 6

Course responsible and lecturer (name, academic title): **Dr. habil László Hanka PhD**

Course classification: **Basic course (subjects) in the field of safety and security science**

Proportion of theoretical and practical content, "Training character":
50 % - 50% theory - practice

Type of class: lecture / seminar / practice / consultation and 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): exam

Additional (specific) methods of knowledge assessment:
Presenting mathematcal models, using Excel, Matlab codes, Simulink simulation

Curricular placement of the course (which semester): Can be taken in semesters 1–4

Prerequisites (if any): no

Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired

- 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 probablity, prior and posterior distributions
- tools of mathematical statistics, estimation theory, confidence intarvals, hypothesis testing, goodness of fit tests, etc.

2–5 most important underlined required readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):

- 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

Risk assessment with probabilistic methods
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

- Ross: Introduction to probability models. Academic press. 2010. ISBN: 978-0-12-375686-2
2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):
- Environmental Protection Agency: Risk assessment forum, Probabilistic risk assessment methods and Case studies. USA, 2014 - Simmons: Undrestanding risk: Risk assessment methodolgies 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

Scientific research methodology
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

Course title: **Scientific research methodology**	Credit value: 6

Course responsible and lecturer (name, academic title): Prof. Em. Dr. Berek Lajos László Ph.D.

Course classification: <u>Basic course (subjects) in the field of safety and security science</u>/ Research topic related basic course / Optional subject

Proportion of theoretical and practical content, "Training character": 60% - 40.% theory - practice

Type of class: lecture / seminar / practice / consultation and total number of classes in the given semester: 30 classes **Methods and (specific) approaches, characteristics used to deliver the course content:** e.g. case presentations and case study analyses, project work, others... Lecture using the frontal method, seminar discussing pre-assigned questions with my supervisor.

Form of assessment (exam / practical grade / other): exam grade Additional (specific) methods of knowledge assessment: The evaluation consists of two parts: firstly, the discussion of the given questions in the seminar, and secondly, the evaluation of a scientific article or conference presentation prepared for the subject.

Curricular placement of the course (which semester): Can be taken in semesters 1–4

Prerequisites (if any): (*typically there are none!*) -

Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired
• General, specific and particular methods of scientific research. • Basic, developmental research and adaptation. • The most common empirical methods. • Types of logical methods: • The most important mathematical research methods. • Basic procedures and practices used in the research process.

2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):
- Dr. Berek Lajos, Dr. Rajnai Zoltán, Berek László: A tudományos kutatás folyamata és módszerei, Óbudai Egyetem, Budapest, pdf 2018 ISBN 978-963-449-071-5 - Dr. Berek Lajos, Dr. Rajnai Zoltán, Berek László: A tudományos kutatás folyamata és módszerei, Óbudai Egyetem, Budapest, 2022. ISBN 978-963-449-258-0, pdf ISBN 978-963-449-259-7

2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):

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Scientific research methodology
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

- Géring Zs.- Király G.-Fűzi B.: Kutatás módszertani segédletek, BGE Budapest, 2019 https://publikaciotar.uni-bge.hu/id/eprint/1621/1/Kutat%C3%A1sm%C3%B3dszertani%20sed%C3%A9gletek_egybe.pdf
- Boncz I,: Kutatásmódszertani alapismeret, PTE Pécs, 2015. ISBN 978-963-642-826-6
  https://www.etk.pte.hu/protected/OktatasiAnyagok/!Palyazati/sport/Kutatasmodszertan_e.pdf

Date: 12. september 2025

Prepared by:

Dr. Berek Lajos

The place and role of security science in the system of sciences
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

Course title: **The place and role of security science in the system of sciences**	Credit value: 6

Course responsible and lecturer (name, academic title): **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% - 30% theory - practice**

Type of class: **lecture** / seminar / practice / consultation and 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 (which semester): **Can be taken in semesters 1–4**

Prerequisites (if any): (*typically there are none!*) **None**

Course description: Objective of the course, a concise yet informative description of the knowledge to be acquired
- **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.**

The place and role of security science in the system of sciences
COURSE SYLLABUS
Doctoral School on Safety and Security Sciences

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.
2–5 most important <u>required</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):
- **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**
2–5 most important <u>recommended</u> readings (textbooks, study materials) with bibliographic data (author, title, publication details, pages, ISBN):
- **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