



## COURSE SYLLABUS

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| Course title:<br><b>Critical Infrastructure in a Special Context: Analysis of Water Security and Supply Challenges in Africa</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Peter Gergo Juhasz, PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>100% theory – 0% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Classroom lectures, case presentations and case studies, participation in project work (article writing).                                                                                                                                                                                                                                          |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The student has the opportunity to publish in the English-language, international journal operated by the African Research Institute of the Doctoral School of Security Studies (Journal of Central and Eastern European African Studies/JCEEAS)                                                                                                                                                                                                                         |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| <b>Course description:</b><br><br>This course examines the critical role of water in Africa and the complex challenges associated with water supply and security in various regions and facilities, including refugee camps. Students will gain an understanding of the historical and contemporary development efforts in the continent, assessing both their successes and failures. Emphasis is placed on exploring innovative technical and technological solutions, with active engagement of African partner organizations and experts, to enhance water security and optimize water supply systems. |                        |



**Learning Objectives:** By the end of the course, students will be able to:

1. Analyze the hydrographic, climatic, and topographical factors influencing water availability in Africa.
2. Evaluate traditional and contemporary methods of water supply and management.
3. Assess the impacts of modernization, urbanization, agriculture, and natural resource exploitation on water resources.
4. Examine the role of water scarcity in migration and regional stability.
5. Identify and critique local and international initiatives aimed at improving water security.
6. Contribute to development-focused projects by proposing feasible solutions in collaboration with partner organizations.

**Course Topics:**

- Hydrographic characteristics of Africa
- Challenges posed by varying climates and topography
- Traditional water supply methods
- Irrigation practices and their sustainability
- Transportation and water logistics
- Fishing and aquaculture management
- Water storage and preservation techniques
- Issues arising from urbanization, deforestation, and agricultural expansion
- Water scarcity as a driver of migration
- Wastewater treatment challenges in critical regions
- Local and international development initiatives
- Student contributions to practical development projects
- Case Study: Democratic Republic of the Congo
- Case Study: Malawi

**Required readings (textbooks, study materials):**

Tünde Anna Kovács, Igor Fürstner: Critical Infrastructure Protection: Advanced Technologies for Crisis Prevention and Response, Cham, Springer Nature, 2025, ISBN: 9789402423082, 339 oldal.

Tünde Anna Kovács, Zoltán Nyikes, Tamás Berek, Norbert Daruka, László Tóth: Critical Infrastructure Protection in the Light of the Armed Conflicts, Cham, Springer Nature, 2024, ISBN: 9783031479908, 534 oldal.

Ryan K. Baggett, Brian K. Simpkins: Homeland Security and Critical Infrastructure Protection, 2nd Edition, Santa Barbara, California, ABC-CLIO, 2018, ISBN: 9798216098744, 432 oldal.



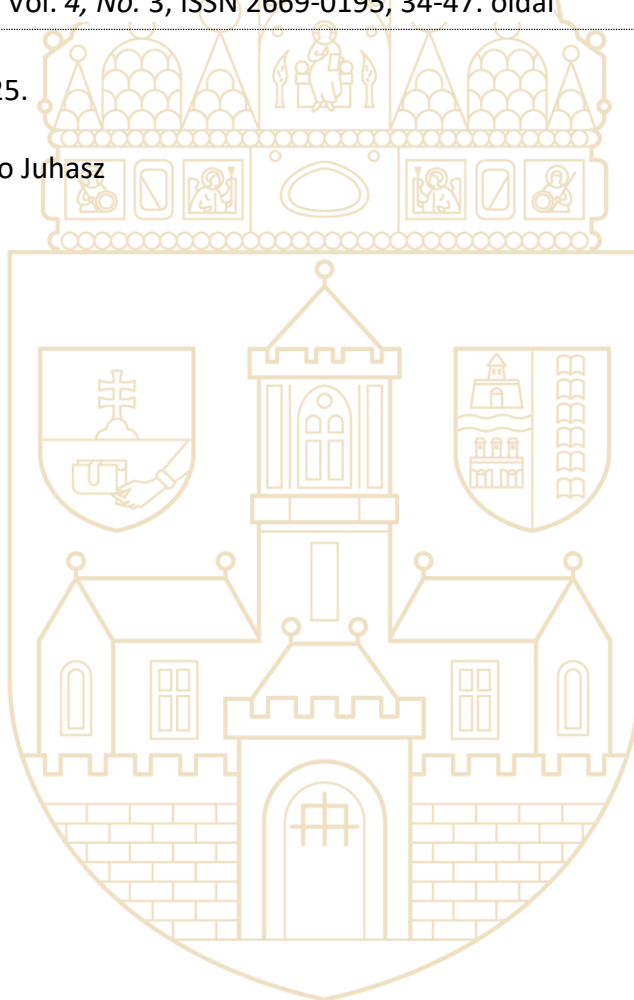
Veress, S. J., Juhász, P. G., & Szeremley, C.: Food Security of Region around Nyangezi in Eastern Congo and Lake Bunyonyi in Uganda. *Journal of Central and Eastern European African Studies*, 2023, Vol. 3, No. 4., ISSN: 2786-1902, 130-144. oldal  
Juhász, P. G., & Szeremley, C.: Work of a Local NGO VETO, in Contrast with the International Organisations in the Eastern Congo. *Journal of Central and Eastern European African Studies*, 2023, Vol. 3, No. 3., ISSN: 2786-1902, 18-39. oldal

Recommended readings (textbooks, study materials):

Szeremley, C., & Juhász, P. G.: The DNS educational system as a device helping to prevent the spread of radicalisation in Malawi. *Journal of Central and Eastern European African Studies*, 2021, Vol. 1 No. 3, ISSN: 2786-1902, 119-134. oldal  
Tampu, S., & Juhasz, P. G.: Clean water in the slums of East Africa. *Insights into Regional Development*, 2022, Vol. 4, No. 3, ISSN 2669-0195, 34-47. oldal

Date: Budapest, 01. 09. 2025.

Prepared by: Dr Peter Gergo Juhasz





## COURSE SYLLABUS

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>A Special Variant of Critical Infrastructure: Food Safety and Food Security in the Differently Endowed Regions of Africa</b>                                                                                                                                                                                                                                                                                                                                            | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Peter Gergo Juhasz, PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                         |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>100% theory – 0% practice</b>                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Classroom lectures, case presentations and case studies, participation in project work (article writing).                                                                                                                           |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The student has the opportunity to publish in the English-language, international journal operated by the African Research Institute of the Doctoral School of Security Studies (Journal of Central and Eastern European African Studies/JCEEAS)                                                                                                          |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| <b>Course description:</b><br><br>The course aims to provide students with an understanding of the underlying causes of food-related challenges on the African continent, with particular emphasis on the differences resulting from the diverse characteristics of individual countries and regions.<br><br>Students will: <ul style="list-style-type: none"><li>gain insight into the food security situation of African countries and the factors behind regional disparities,</li></ul> |                        |



- examine the impacts (and in many cases the failures) of previous development efforts,
- explore the potential of new technical and technological solutions for enhancing food supply and food security,
- analyze in detail the interconnections and interactions between extreme poverty, radicalization, armed conflicts, food security, and migration.

**Required readings** (textbooks, study materials):

Tünde Anna Kovács, Igor Fürstner: Critical Infrastructure Protection: Advanced Technologies for Crisis Prevention and Response, Cham, Springer Nature, 2025, ISBN: 9789402423082, 339 oldal.

Tünde Anna Kovács, Zoltán Nyikes, Tamás Berek, Norbert Daruka, László Tóth: Critical Infrastructure Protection in the Light of the Armed Conflicts, Cham, Springer Nature, 2024, ISBN: 9783031479908, 534 oldal.

Ryan K. Baggett, Brian K. Simpkins: Homeland Security and Critical Infrastructure Protection, 2nd Edition, Santa Barbara, California, ABC-CLIO, 2018, ISBN: 9798216098744, 432 oldal.

Veress, S. J., Juhász, P. G., & Szeremley, C.: Food Security of Region around Nyangezi in Eastern Congo and Lake Bunyonyi in Uganda. *Journal of Central and Eastern European African Studies*, 2023, Vol. 3, No. 4., ISSN: 2786-1902, 130-144. oldal

Juhász, P. G., & Szeremley, C.: Work of a Local NGO VETO, in Contrast with the International Organisations in the Eastern Congo. *Journal of Central and Eastern European African Studies*, 2023, Vol. 3, No. 3., ISSN: 2786-1902, 18-39. oldal

**Recommended readings** (textbooks, study materials):

Szeremley, C., & Juhász, P. G.: The DNS educational system as a device helping to prevent the spread of radicalisation in Malawi. *Journal of Central and Eastern European African Studies*, 2021, Vol. 1 No. 3, ISSN: 2786-1902, 119-134. oldal

Tampu, S., & Juhasz, P. G.: Clean water in the slums of East Africa. *Insights into Regional Development*, 2022, Vol. 4, No. 3, ISSN 2669-0195, 34-47. oldal

Date: Budapest, 01. 09. 2025.

Prepared by: Dr Peter Gergo Juhasz



## COURSE SYLLABUS

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| Course title:<br><b>Africa in light of the international organisations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Dávid Vogel PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>100% theory - 0% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Type of class: <b>lecture</b> / seminar / practice / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Review of literature review and theoretical background, case presentations, case study analyses, critical current case examination, debate.                                                                                                                                                                                                                                                                                                                            |                        |
| Form of assessment: <b>exam</b> / practical grade / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- The primary goal of the subject 'Africa in light of the international organisations' is to give an overview to the students about the role the international (regional) organisations play in linking Africa to the World and about the position Africa has in the international community.</li><li>- There is a special focus on the South-South Cooperation.</li><li>- Students will gain a broader knowledge about the former and current African regional organisations and the specifics of the relationship between the continent and Hungary (based on the common memberships in international organisations).</li></ul> |                        |



**Required readings (textbooks, study materials):**

- Reinalda, B., & Louis, M. (Eds.). (2025). *Routledge Handbook of International Organization*. Routledge, 698 pages, ISBN 9781032540696, <https://doi.org/10.4324/9781003428138>
- Balogun, E., Mwaba, A.K. (2023). African Union Reform: Challenges and Opportunities. In: Hare, P.W., Manfredi-Sánchez, J.L., Weisbrode, K. (Eds.) *The Palgrave Handbook of Diplomatic Reform and Innovation. Studies in Diplomacy and International Relations*. pp 277–294, Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-031-10971-3\\_13](https://doi.org/10.1007/978-3-031-10971-3_13).
- Stapel, S. (2022). *Regional Organizations and Democracy, human rights, and the rule of law: The African Union, Organization of American States, and the diffusion of institutions*. Palgrave Macmillan. 349 pages, ISBN 9783030903978, <https://doi.org/10.1007/978-3-030-90398-5>.
- Reynolds, J. T., Gilbert, E. T. (2011). *Africa in World History: From Prehistory to the Present*. Pearson. 416 pages. ISBN 9780205053995.
- Fredland, R. (1990). *A guide to African International Organizations*. Hans Zell Pub, 324 pages, ISBN 9780905450902.

**Recommended readings (textbooks, study materials):**

- Müller, L. M. (2024). *The Rise of a Regional Institution in Africa Agency and Policy-Formation within the ECOWAS Commission*. Routledge, 184 pages, ISBN 9781032133089, <https://doi.org/10.4324/9781003228547>.
- Saleem, A. K. (2023). *United Nations Peace Operations in Africa Civil-Military Coordination and State-Building*. Routledge India, 214 pages, ISBN 9781032230467, <https://doi.org/10.4324/9781003275404>.
- Bandeira Jerónimo, M., & Pedro Monteiro, J. (2020). International Organizations in Colonial Africa. *Oxford Research Encyclopedia of African History*. <https://doi.org/10.1093/acrefore/9780190277734.013.440>.
- Wilson, Z. (2006). *The United Nations and Democracy in Africa (Studies in International Relations)*. Routledge. 268 pages. ISBN 978-1593102340
- Macqueen, N. (2002). *United Nations Peacekeeping in Africa Since 1960*. Routledge. 328 pages. ISBN 9780582382534.
- Söderbaum, F. (1996). *Handbook of Regional Organizations in Africa*. Nordic Africa Institute, 165 pages. ISBN 9789771064008.

Date: Budapest, 05.09. 2025

Prepared by: Dr. David Vogel



## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>African conflicts</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. János Besenyő</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>100% theory – 0% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Classroom lectures, case presentations and case studies, participation in project work (article writing).                                                                                                                                                                            |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The student has the opportunity to publish in the English-language, international journal operated by the African Research Institute of the Doctoral School of Security Studies (Journal of Central and Eastern European African Studies/JCEEAS)                                                                                                                                                           |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- To introduce students to the conflicts taking place on the African continent, their causes, forms of manifestation, functioning and the domestic, regional and international responses to them.</li><li>- To present the conflicts and forms of warfare before the colonial period, their impact on African societies.</li><li>- To present the conflicts of the colonial period, their actors and their effects on the international and African scene.</li></ul> |                        |



- To present the conflicts that emerged after the colonial system, the interests and roles of domestic and international actors.

**Required readings (textbooks, study materials):**

Evert Kleynhans, Marco Wyss: The Handbook of African Defence and Armed Forces, Oxford University Press, 2025, ISBN: 9780198884750, 896 pages.

János Besenyő, Korotayev Andrey, Issaev Leonid: Terrorism and Political Contention: New Perspectives on North Africa and the Sahel Region, Cham, Switzerland, Springer Nature Switzerland, 2024, ISBN: 9783031534294, 418 pages.

Besenyő János, Khanyile Moses B., Vogel David: Terrorism and Counter-Terrorism in Modern Sub-Saharan Africa, Cham, Switzerland, Springer Nature Switzerland, 2024, ISBN: 9783031566738, 300 pages.

Moosa Elayah, Bakeel Alzandani: Conflicts in the Middle East and Africa: State, Non-State Actors and Unheard Voices, New York, Taylor & Francis, 2024, ISBN: 9781003854814, 190 pages.

Carlson Anyangwe: Contemporary Wars and Conflicts Over Land and Water in Africa, Lanham, Lexington Books, 2024, ISBN: 9781666910377, 350 pages.

Eeben Barlow: The War for Africa: Conflict, Crime, Corruption, and Foreign Interests, South Africa, 30 Degrees South Publishers, 2024, ISBN: 9781928359906, 524 pages.

Festus B. Aboagya: Indigenous African Warfare, Accra, Ghana, Ulinzi Africa Resources, 2016, ISBN: 9789964721480, 539 pages.

**Recommended readings (textbooks, study materials):**

Marco Jowell: Peacekeeping in Africa: Politics, Security and the Failure of Foreign Military Assistance, I.B.Tauris, 2018, ISBN: 9781786723413, 288 pages.

Cedric De Coning, Linnéa Gelot, John Karlsrud: The Future of African Peace Operations: From the Janjaweed to Boko Haram, London, Zed Books Ltd., 2016, ISBN: 9781783607105, 170 pages.

Joachim Koops, Norrie MacQueen, Thierry Tardy, Paul D. Williams: The Oxford Handbook of United Nations Peacekeeping Operations, Oxford University Press, 2015, ISBN: 9780191509544, 800 pages.

Isiaka Badmus: The African Union's Role in Peacekeeping: Building on Lessons Learned from Security Operations, Cham, Springer, 2015, ISBN: 9781137426611, 277 pages

Marco Wyss, Thierry Tardy: Peacekeeping in Africa: The evolving security architecture, New York, Routledge, 2014, ISBN: 9781317913672, 272 pages.

Norrie Macqueen: United Nations Peacekeeping in Africa Since 1960, New York, Routledge, 2014, ISBN: 9781317877349, 328 pages.

Date: 14.08.2025.

Prepared by: Prof. Dr. János Besenyő



## COURSE SYLLABUS

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| Course title:<br><b>African economies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Szabolcs Pásztor</b> , PhD, associate professor at Ludovika University of Public Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>60% theory - 40% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Type of class: <b>lecture</b> / seminar / practice / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Literature review, case study analysis, and interactive classroom discussion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Additional (specific) methods of knowledge assessment:<br>Creating infographics and data visualizations using Flourish, Inforgram, and Datawrapper.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| <p>Since the turn of the millennium, Africa's growing economic role and enormous market potential have attracted increasing attention from scientists, investors and political decision-makers. Many African countries are among the world's fastest-growing economies, attracting investment from multinational companies, sovereign wealth funds, and emerging market partners. The 2020s have added new dimensions to this picture. The COVID-19 pandemic disrupted supply chains, changed labor markets, and strained fiscal balances. Geopolitical tensions, including the war in Ukraine, triggered food and fuel price shocks while reshaping Africa's trade diplomacy. Global trade policy, such as the tariff regime introduced during the Trump administration and the ongoing US-China rivalry, has further affected Africa's access to markets, investment flows and bargaining position. At the same time, climate change, the energy transition, and rapid digitalization are also reshaping the continent's economic</p> |                        |



priorities. The course aims to provide a comprehensive, fact-based overview of these dynamics.

Combining relevant theory, economic history, and practical case studies, the course examines both long-term structural trends and the immediate challenges of the 2020s.

Economic history – tracing Africa's economic transformation from the colonial era to independence, through structural adjustment and the growth waves of the early 21st century, highlighting patterns of resilience and structural change.

Political economy and business – examining how global crises, regional integration (AfCFTA), industrial policy, demographic trends, and technological changes are shaping Africa's current and future economic situation.

Upon completion of the course, students will be able to critically assess Africa's growth potential and structural constraints and understand the interactions between global events (wars, trade disputes, climate shocks) and domestic economic policy. In addition, they will be able to assess sector-specific opportunities and risks for doing business in African markets. They will be able to participate in informed debates on Africa's role in a rapidly evolving, multipolar global economy.

**Required readings (textbooks, study materials):**

- Pásztor, Sz. (2024): Ethiopia: Building a Developmental State or Just Overheating the Economy? In: Kiss, Judit; Tarrósy, István (Szerk.): Selected African Studies in Memory of Zsuzsanna Biedermann. Newcastle upon Tyne, Egyesült Királyság / Anglia: Cambridge Scholars Publishing (2024), ISBN: 978-1-0364-0445-1, 345 p. pp. 73-103., 31 p.
- Onyeiwu, S. (2024): Emerging Issues in Contemporary African Economies: Structure, Policy, and Sustainability. Palgrave Macmillan Cham, ISBN: 978-3-031-74240-8, p. 454.
- Carmody, P. & Murphy, J. (Eds.) (2024): Handbook of African Economic Development. Elgar Handbooks in Development, ISBN: 978-1-80088-579-0, p. 606.
- von Carlowitz, P. & Züfle, S. (2024): Business Success in Africa: Academic and Managerial Insights. Springer Cham, ISBN: 978-3-031-70383-6, p. 361.

**Recommended readings (textbooks, study materials):**

- McMillan, M. & Zeufack, A (2023): Labor Productivity Growth and Industrialization in Africa. Policy Research Working Papers World Bank, 10294. <http://hdl.handle.net/10986/39411>
- Kassa, W. & Owusu, S. (2023): Industrialization in Sub-Saharan Africa: Seizing Opportunities in Global Value Chains. Africa Economics Policy Note, Office of the Chief Economist, Africa Region, March 2023, No. 2  
[worldbank.org/curated/en/099536403292330454/pdf/IDU0b281c7b4027af04e1f0900809fc00e098c67.pdf](https://worldbank.org/curated/en/099536403292330454/pdf/IDU0b281c7b4027af04e1f0900809fc00e098c67.pdf)

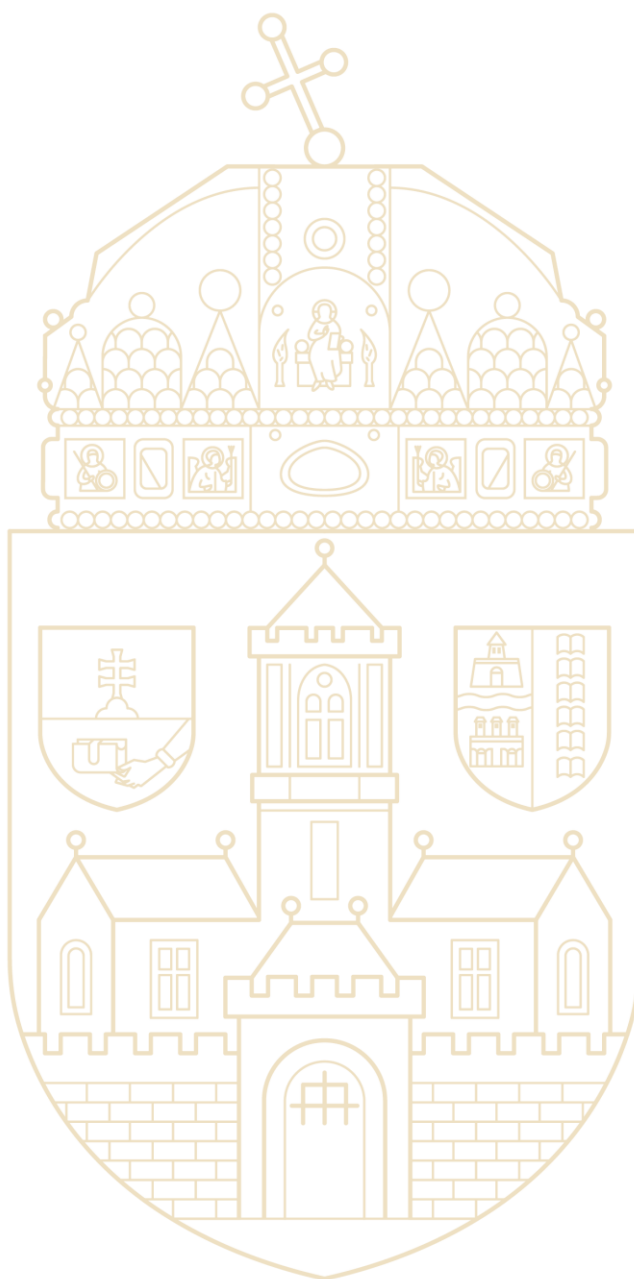


ÓBUDAI EGYETEM  
ÓBUDA UNIVERSITY

Doctoral School on Safety and Security Sciences

Date: 15 August 2025

Prepared by: Dr. Szabolcs Pasztor PhD



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## COURSE SYLLABUS

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>African peacekeeping and peace support operations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. János Besenyő</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>100% theory – 0% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Classroom lectures, case presentations and case studies, participation in project work (article writing).                                                                                                                                                                                                   |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The student has the opportunity to publish in the English-language, international journal operated by the African Research Institute of the Doctoral School of Security Studies (Journal of Central and Eastern European African Studies/JCEEAS)                                                                                                                                                                                  |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- To present and explain African conflicts, their characteristics, dynamics, as the root causes of conflicts.</li><li>- We focus on African peace operations (UN, AU, NATO, EU and other regional organizations), the Christian-Muslim relationship system, migration, the relationship system and cooperation between the countries of the continent and the EU and NATO.</li><li>- Hungary's participation in African peace operations, its cooperation with African countries.</li></ul> |                        |



**Required readings (textbooks, study materials):**

Evert Kleynhans, Marco Wyss: The Handbook of African Defence and Armed Forces, Oxford University Press, 2025, ISBN: 9780198884750, 896 pages.

János Besenyő, Korotayev Andrey, Issaev Leonid: Terrorism and Political Contention: New Perspectives on North Africa and the Sahel Region, Cham, Switzerland, Springer Nature Switzerland, 2024, ISBN: 9783031534294, 418 pages.

Saleem Ahmad Khan: United Nations Peace Operations in Africa: Civil-Military Coordination and State-Building, New York, Taylor & Francis, 2023, ISBN: 9781000859485, 2014 pages.

János Besenyő, Joseph Huddleston, Yahia H. Zoubir: Conflict and Peace in Western Sahara: The Role of the UN's Peacekeeping Mission (MINURSO), Routledge, CRC Press, 2023, ISBN: 9781032257624, 333 pages.

Jonathan Fisher, Nina Wilén: African Peacekeeping, Cambridge University Press, 2022, ISBN: 9781108499378, 272 pages.

Besenyő János: Participation of Hungary in African Operations between 1989-2019, Óbudai University Doctoral School on Safety and Security Sciences, Budapest, 2019, ISBN: 9789634491224, 134 pages.

**Recommended readings (textbooks, study materials):**

Besenyő János, Khanyile Moses B., Vogel David: Terrorism and Counter-Terrorism in Modern Sub-Saharan Africa, Cham, Switzerland, Springer Nature Switzerland, 2024, ISBN: 9783031566738, 300 pages.

Besenyő János: MINURSO United Nations Mission for the Referendum in Western Sahara: Peace Operation Stalled in the Desert, 1991-2021, Warwick, UK, Helion & Company, 2023, ISBN: 9781804514191, 66 pages.

Bruno Charbonneau, Maxime Ricard: Routledge Handbook of African Peacebuilding, New York, Taylor & Francis, 2022, ISBN: 9780429594618, 308 pages.

Han Dorussen: Handbook on Peacekeeping and International Relations, Cheltenham, Edward Elgar Publishing, 2022, ISBN: 9781839109935, 408 pages.

Oliver Furley, Roy May: Peacekeeping in Africa, Routledge, 2021, ISBN: 9781000347548, 338 pages.

Besenyő János: Darfur Peacekeepers - The African Union peacekeeping mission in darfur (AMIS) from the perspective of a Hungarian military advisor, Paris, France, Éditions L'Harmattan, 2021, ISBN: 9782140190568, 230 pages.

Date: 14.08.2025.

Prepared by: Prof. Dr. János Besenyő



## COURSE SYLLABUS

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Application of multibody dynamics in Biomechanics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. habil. Gusztáv Fekete, PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Type of class: <b><u>lecture</u></b> / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: lectures, practical applications (use of MSC.ADAMS and Excel), case presentations and home work.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| <ul style="list-style-type: none"><li>- Classification of dynamic systems based on constraints (holonomic, non-holonomic). Methods of describing constraint equations.</li><li>- Two-dimensional, double (compound) pendulum with Newton-Euler equation. Creation of the differential algebraic equation (DAE) of the mechanical system using free-body diagrams.</li><li>- Potential and virtual velocity fields. Introducing the principle of virtual power.</li><li>- The Lagrange multiplier. Introduction of Jacobian matrix.</li><li>- Creation of DAE with passive members (modelling spring and damper).</li><li>- Standard solution method of DAE systems.</li><li>- Approximate methods for solving first-order differential equations. Explicit Euler and Center-point approximation. Solving linear and non-linear equations.</li></ul> |                        |



- Approximate methods for solving second-order differential equations. Introduction of Euler's explicit and implicit solvers.
- Solution of non-linear second-order differential equations. Demonstration of Euler-Cromer method for the numerical solution of a DAE.
- Description of three-dimensional movements. Description of the finite angular change and angular velocity of rigid bodies by using Euler angles and quaternions.
- Multibody dynamics case studies: Gear wear modelling
- Multibody dynamics case studies: Modelling wear in prosthetics.

**Required readings (textbooks, study materials):**

Fekete Gusztáv: Bevezetés a többtestdinamikai modellezésbe. Egyetemi jegyzet, Eötvös Loránd Tudományegyetem, 2023. ISBN: 978-615-01-5898-31.

Jason J. Moord: Learn Multibody dynamics. 2025. Link: <https://moorepants.github.io/learn-multibody-dynamics/learnmultibodydynamics.pdf>

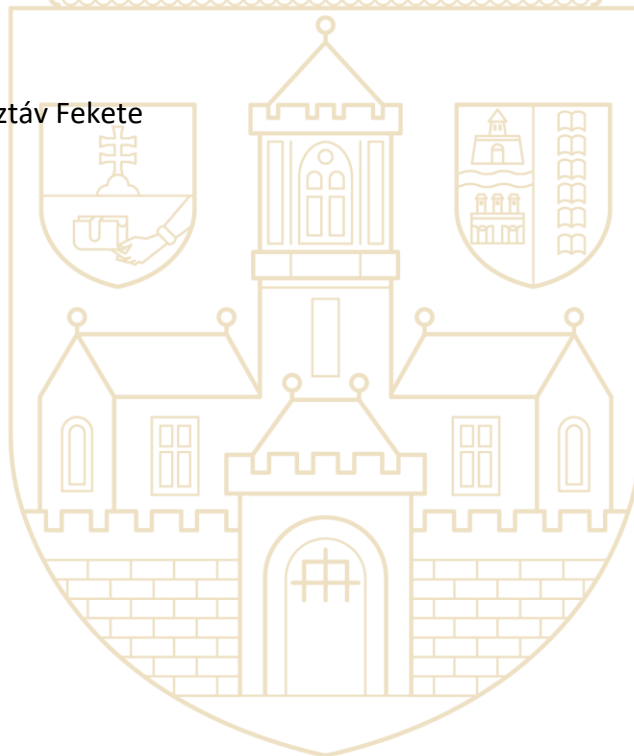
**Recommended readings (textbooks, study materials):**

H. Vallery, A. L. Schwab: Advanced Dynamics. TU Delft, 2020. ISBN: 978-90-8309-060-3.

Jielong Wang: Multiscale Multibody Dynamics. Springer, 2023. ISBN: 978-981-19-8443-3.

Date: 2025.09.08.

Prepared by: Dr. habil. Gusztáv Fekete





## COURSE SYLLABUS

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Course title:<br><b>Application of Soft-Computing Techniques in Multi-Agent mobile robot Systems (MAS)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Credit value: 6 |
| Course responsible and lecturer:<br><b>István Nagy, PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| Proportion of theoretical and practical content, "Training character":<br><b>70% theory - 30% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Basic definitions, divisions, functions, and methods related to the subject are introduced in the form of a lecture. This is followed by an analysis of known methods, followed by the preparation and publication of an article in the last third of the semester.                                                                                                                                     |                 |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The colloquium is related to the advanced status of the own <b>article or conference paper</b> .                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- Review of basic localization, trajectory planning, navigation, and map-making operations of mobile robots.</li><li>- Self-organizing capabilities of multi-agent mobile robots. Introduction to agents and their related definitions (autonomy, adaptivity, greedy agent, MÁR systematizations).</li><li>- Divisions of mobile robot workspaces and then creation of various graph maps based on these. Introduction to various graph search methods (Dijkstra, A*, A**, Bellman-Ford graph search, Floyd-Warshall graph search, Ant Colony algorithm, Swarm technology, Q-</li></ul> |                 |



learning and reinforcement (RL) learning. Application of Markov decision-making mechanism to multi-agent environments.

**Required readings** (textbooks, study materials):

- G. Lozenguez, On the Distributivity of Multi-agent Markov Decision Processes for Mobile Robotics, International Symposium on Swarm Behavior and Bio-Inspired Robotics, Jun 2021, Kyoto, Japan. hal-03545990,
- J. Hao, Ho-Fung Leung, Interactions in Multiagent Systems, World Scientific Publishing, 2018.
- N. Osman, C. Sierra (Eds), Autonomous Agents and Multiagent Systems, AAMAS2016 Workshop, Revised Selected Papers, Singapore, 2016.
- Johnson, D., Chen, G., and Lu, Y. (2022). Multi-agent reinforcement learning for real-time dynamic production scheduling in a robot assembly cell. IEEE Robot. Autom. Lett. 7, 7684–7691. doi:10.1109/lra.2022.3184795
- Lan, X., Qiao, Y., and Lee, B. (2021). "Towards pick and place multi robot coordination using multi-agent deep reinforcement learning," in 2021 7th International Conference on Automation, Robotics and Applications (ICARA) (IEEE), 85–89.
- J. Liu, J. Wu: Multi-Agent Robotic Systems. CRC Press LLC, Boca Raton, Florida, 2001.

**Recommended readings** (textbooks, study materials):

- Pol, S., Baer, S., Turner, D., Samsonov, V., and Meisen, T. (2021). "Global reward design for cooperative agents to achieve flexible production control under real-time constraints," in Proceedings of the 23rd International Conference on Enterprise Information Systems (ICEIS 2021), Setúbal, Portugal, 515–526.
- I. Nagy: Genetic Algorithms Applied for Potential Field Building in Multi-Agent Robotic System, Proc. ICC3'03, IEEE International Conf. on Computational Cybernetics, Siófok, Hungary 2003.
- Nguyen, T. T., Nguyen, N. D., and Nahavandi, S. (2020). Deep reinforcement learning for multiagent systems: A review of challenges, solutions, and applications. IEEE Trans. Cybern. 50, 3826–3839. doi:10.1109/tcyb.2020.2977374
- I. Nagy: Behaviour Study of a Multi-agent Mobile Robot System During Potential Field Building, Acta Polytechnica Hungarica, Vol. 6, Nr. 4, pp.: 111-136, 2009.

Date: 2025. 10. 15.

Prepared by: István Nagy, PhD



## COURSE SYLLABUS

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Applied Market Research</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Mónika Garai-Fodor Prof. Dr.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Type of class: <b><u>lecture</u></b> / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: case studies and electronic theoretical material, as well as independent project work. Concrete research examples and research reports provide practical guidance for the subject.                                                                                                                                                                                                                                                                                                                                                        |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br><br>Additional (specific) methods of knowledge assessment: <b>Presentation</b> of the results of independent project work or qualitative research (minimum 10 mini-focus group studies and/or quantitative research involving at least 100 participants) based on the topic of the research presentation, using descriptive and two- or multi-variable analyses.                                                                                                                                                                                                                                                                                                                                                           |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- The course can help by providing guidance on which methodology and research tools are appropriate and can be used when examining a research question or hypothesis.</li><li>- The course provides students with a comprehensive overview of the steps involved in the research process, the main primary data collection options, and the methodologically and professionally correct interpretation of the results.</li><li>- The course introduces the types and tools of qualitative and quantitative surveys.</li><li>- Students learn the rules for compiling standardized questionnaires, the different types of questions and their corresponding measurement levels, as well as the possibilities,</li></ul> |                        |



advantages, and disadvantages of their use.

- However, in addition to methodologically sound data collection, it is equally important to be able to interpret the data and results correctly. The course also covers the structure of research reports and how research processes build on each other, right up to the rules for presenting research results and practical guidelines.
- With this knowledge, students will be able to make informed decisions about the planning and implementation of their own research and learn the rules for correctly interpreting the results.

**Required readings (textbooks, study materials):**

E-learning material related to the subject (Prof. Dr. Mónika Garai-Fodor: Applied Market Research, 2023)

Mitev Zoltán Ariel, Judit Simon, Tamás Gyulavári, Ágnes Neulinger, Edit Neumann-Bódi, Krisztián Szűcs (2014): Fundamentals of Marketing Research, ISBN: 978 963 05 9528 5

Krisztián Szűcs, Erika Lázár, Péter Németh (2023): Marketing Research 4.0. 978 963 454 853 9

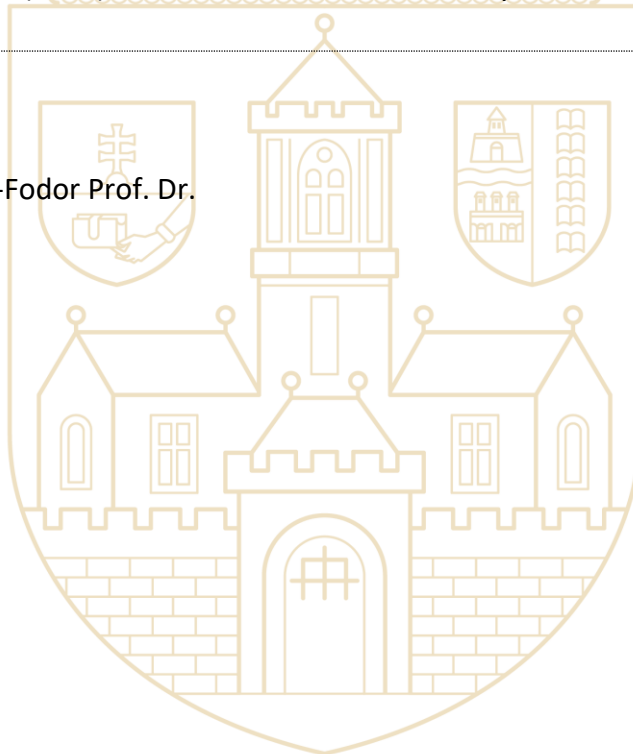
**Recommended readings (textbooks, study materials):**

Naresh Malhotra (2002): Marketing Research, Budapest, KJK, ISBN: 9632246470

László Sajtos, Ariel Mitev (2007): SPSS Research and Data Analysis Handbook, Alinea Publishing

Date: 10.23.2025.

Prepared by: Mónika Garai-Fodor Prof. Dr.





## COURSE SYLLABUS

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Chaos Theory</b>                                                                                                                                                                                                                                                             | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Livia Cvetityanin, Prof.Em.</b>                                                                                                                                                                                                                           |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                              |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                       |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: -                                                         |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other                                                                                                                                                                                                                                 |                        |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                         |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                      |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                              |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                       |                        |
| <b>Objective of the course:</b> To provide students with fundamental knowledge of chaos theory and its applications in nonlinear dynamical systems.                                                                                                                                              |                        |
| <b>Description of knowledge to be acquired:</b> Students will acquire                                                                                                                                                                                                                            |                        |
| <ul style="list-style-type: none"><li>- a concise understanding of nonlinear dynamics,</li><li>- sensitivity to initial conditions,</li><li>- attractors,</li><li>- bifurcations,</li><li>- Lyapunov exponents, and</li><li>- examples of chaotic behavior in science and engineering.</li></ul> |                        |



**Required readings (textbooks, study materials):**

Robert C. Bishop, An Introduction to Chaotic Dynamics, IOP Publishing, 2022, ISBN: 978-0750364539

Nonlinear Dynamics - Special Issue: Chaos theory and applications: A retrospective on lessons learned and missed or new opportunities, editors: Laura Gardini, Celso Grebogi, Stefano Lenci, Vol.102, Issue 2, 2020 (28 articles)

Chaos Theory and Applications (in Applied Sciences and Engineering), Vol.5, Issue 2, 2023 (8 articles) ISSN: 2687-4539

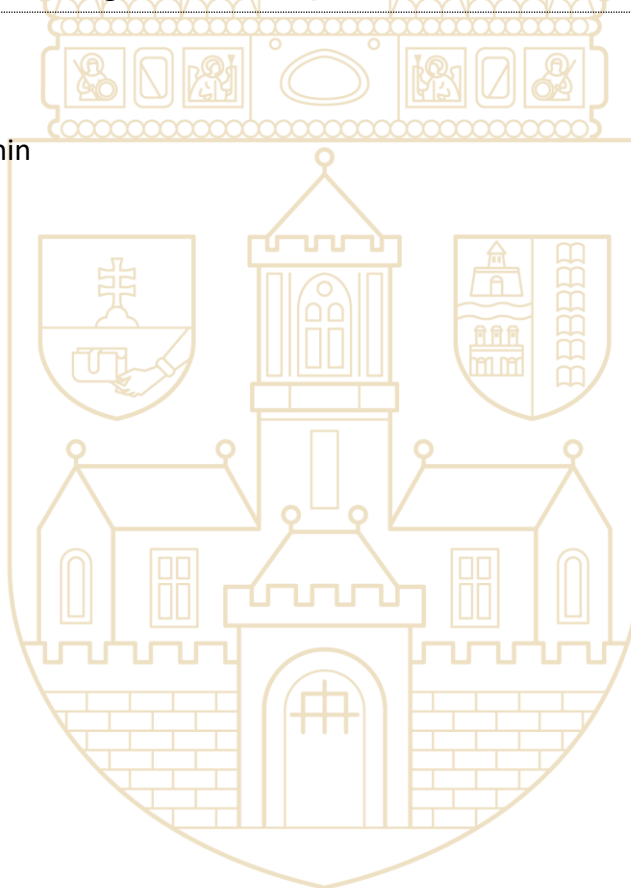
**Recommended readings (textbooks, study materials):**

Adib Mashuri, Nur Hamiza Adenan, Nor Suriya Abd Karim, Tho Siew Wei, Zhaofeng Zeng, Application of Chaos Theory in Different Fields - A Literature Review, Journal of Science and Mathematics Letters, Vol.12, Issue 1, 92-101, 2024

Feier Su, The Chaos Theory and its Application, Journal of Physics: Conference Series 2012, 2021, 012118, IOP Publishing, doi:10.1088/1742-6596/2012/1/012118

Date: 31 August 2025

Prepared by: Livia Cvetityanin





## COURSE SYLLABUS

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Critical infrastructure security technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Dóra Maros</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ <b><u>Research topic related basic course</u></b> / Optional subject                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: 30 classes<br>Methods and (specific) approaches, characteristics used to deliver the course content: project work, reading compulsory and recommended literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br><br>Additional (specific) methods of knowledge assessment: Additional (specific) methods used in knowledge assessment: submission of an 8-10 page essay/article on a topic related to the subject; 4 consultations per semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Curricular placement of the course:<br>Can be taken in <b>1-4 semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| <b>Course description:</b><br><br>Objective of the course: To introduce students to the concept of critical infrastructure and the relevant international (EU) regulations in the field of critical infrastructure protection, the definition of each critical infrastructure sector and the exploration of their mutual dependence (interdependence) primarily by analyzing the security background and technical solutions for their operational continuity. The course helps students acquire knowledge related to their research topic by laying the foundation for the field of technical-security science.<br>Knowledge material: Types of critical infrastructures (CI), definition of each CI sector, and classification of their threats into classes. Mathematical description and modeling of interdependencies, with particular regard to the unique characteristics of each critical |                        |



infrastructure sector. International and domestic regulatory issues of CI protection methods, with particular regard to their harmonization. Interpretation of security regulations and threat factors, their associative description and analysis.

**Related readings** (textbooks, study materials):

- 2024. évi LXXXIV. törvény a kritikus szervezetek ellenálló képességéről
- 474/2024. (XII. 31.) Korm. rendelet a kritikus szervezetek ellenálló képességéről szóló törvény végrehajtásáról
- LÉTFONTOSSÁGÚ RENDSZEREK VÉDELME, Infojegyzet, 2024 október 31, ([https://www.parlament.hu/documents/d/guest/infojegyzet\\_2024\\_25\\_letfontossagu\\_rendszerek\\_vedelme](https://www.parlament.hu/documents/d/guest/infojegyzet_2024_25_letfontossagu_rendszerek_vedelme))
- What Is Critical Infrastructure Protection (CIP)? FORTINET (<https://www.fortinet.com/resources/cyberglossary/critical-infrastructure-protection>)

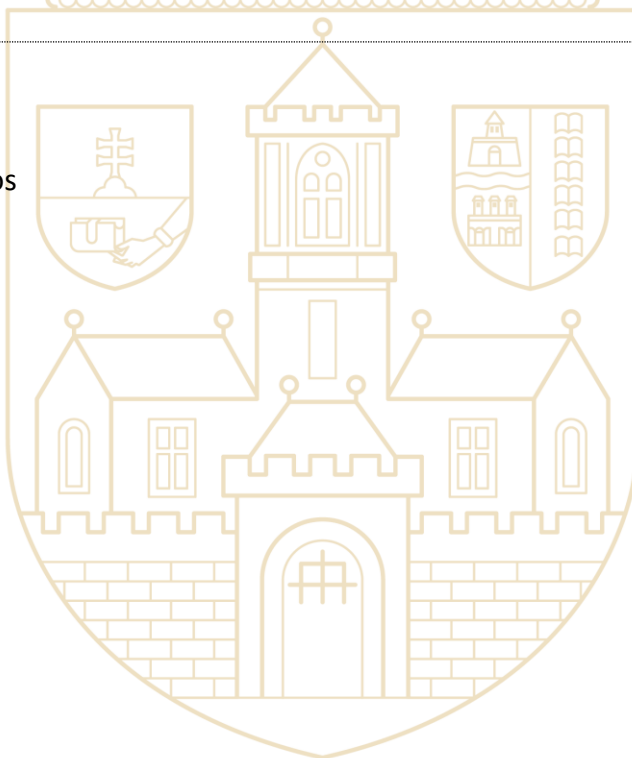
**Recommended readings** (textbooks, study materials):

ISO 31000, "Risk management – Guidelines"

Kockázatelemzés folyamata: [https://kti.uni-nke.hu/document/vtkk-uni-nke-hu/iii\\_tantargy-kockazatelemzes.original.pdf](https://kti.uni-nke.hu/document/vtkk-uni-nke-hu/iii_tantargy-kockazatelemzes.original.pdf)

Date: 01.09.2026

Prepared by: Dr. Dóra Maros





## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Data mining using artificial intelligence</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. habil. Gábor Kiss PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Type of class: lecture / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: <ul style="list-style-type: none"><li>- During the semester, we perform data mining on various data sets using artificial intelligence.</li><li>- At the end of the semester, students must analyze the data collected during their research in a project. The end-of-semester evaluation is based on the quality of this analysis.</li></ul>                                                                                                               |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| <b>Course description:</b> <ul style="list-style-type: none"><li>- In doctoral research, it is typically the extraction of knowledge from a large data set that leads to the formulation of the thesis and the methods used to support it.</li><li>- The use of artificial intelligence in this area also offers new opportunities that should be exploited, thereby increasing the weight of the dissertation work in the field of professional recognition. This is what the subject aims to help in.</li><li>- The course introduces the principles of Artificial Intelligence, machine learning, neural networks and deep learning. Data collection, data cleansing and data fusion.</li></ul> |                        |



- We will be introduced to data visualization, classification (nearest neighbor classes, decision trees, Naive Bayes, etc.) Regression analysis, clustering, anomaly detection, time series analysis, dimensionality reduction, supervised and unsupervised learning methods for knowledge extraction.

**Required readings (textbooks, study materials):**

Di Wu: Data Mining with Python. Theory, Application, and Case Studies, 2024, ISBN 9781032598901.

Vijaya Kumar Suda: Data Labeling in Machine Learning with Python, 2024, ISBN 9781804610541

**Recommended readings (textbooks, study materials):**

Sengar D. Modern Data Mining with Python. A risk-managed approach, 2024, ISBN 9789355519146

Date: 02.09.2025.

Prepared by: Dr. habil. Gábor Kiss





## COURSE SYLLABUS

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title: <b>Data security in CRM systems</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Regina Zsuzsanna Reicher, Ph.D.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>60% theory - 40% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Type of class: lecture / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Review of case studies, familiarization with market software. During the course, students will explore the literature related to their topic.                                                                                                                                                                             |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>Oral presentation and preparation of a publishable study closely related to the candidate's topic. Full-length conference presentation in English or Hungarian, or publication in a scientific journal in English or Hungarian.                                                                                                                                                                                                   |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| <b>Course description:</b> <ul style="list-style-type: none"><li>- In this course, PhD students will learn about the methodology that promotes the effective use of a company's business network.</li><li>- They will learn about the possibilities of applying AI in the field of customer management.</li><li>- They examine the security risks of AI and data storage and use, as well as the security risks of customer management.</li><li>- IT security risks are a major focus in this area, as both company and customer data require protection.</li></ul> |                        |



- They will learn about the security solutions used by companies for customer management and the legal and technological background of secure customer data management. They will learn about the advantages of structured information storage, its daily use, and best practices in customer relations designed to support marketing and proactive sales.

**Required readings (textbooks, study materials):**

- Roy, P., Chandrasekaran, J., Lanus, E., Freeman, L., & Werner, J. (2023). A Survey of Data Security: Practices from Cybersecurity and Challenges of Machine Learning. arXiv (Cornell University). <https://doi.org/10.48550/arxiv.2310.04513>
- Huang, Y., Jun, D. L., Lu, B., & Zhou, Y. (2024). Risk analysis in customer relationship management via quantile region convolutional neural Network-Long Short-Term Memory and Cross-Attention mechanism. arXiv (Cornell University). <https://doi.org/10.48550/arxiv.2408.12113>
- Naim, A., Alqahtani, H., Muniasamy, M. A., Bilfaqih, S. M., Mahveen, R., & Mahjabeen, R. (2023). Applications of information systems and data security in marketing management. In Fraud Prevention, Confidentiality, and Data Security for Modern Businesses (pp. 57-83). IGI Global.
- Nunnagupala, L. S. C., Mallreddy, S. R., & Padamati, J. R. (2022). Achieving PCI Compliance with CRM Systems. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 13(1), 529–535. <https://doi.org/10.61841/turcomat.v13i1.14689>

**Recommended readings (textbooks, study materials):**

- Boppana, V. R. (2019). Data Privacy and Security in Dynamics CRM Implementations. Educational Research (IJMCER), 1(2), 35-44.
- Hossain, Q., Hossain, A., Nizum, M. Z., & Naser, S. B. (2024). Influence of artificial intelligence on customer relationship management (crm). International Journal of Communication Networks and Information Security, 16(3), 653-663.
- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ceur-ws.org/Vol-3925/short06.pdf
- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.internationaljournals.org/IJCSE/2024/Volume11-Issue9/IJCSE-V11I9P102.pdf?utm\_source=chatgpt.com

Date: 15. September 2025

Prepared by: Regina Zsuzsánna Reicher, PhD.



## COURSE SYLLABUS

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| Course title:<br><b>Database planning and usage</b>                                                                                                                                                                                                                                                                                                                                       | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>András László KESZTHELYI PhD</b>                                                                                                                                                                                                                                                                                                                   |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                       |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>literature review and practical exercises supported by consultations                                                                            |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br>Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                              |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                               |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                       |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                |                        |
| <ul style="list-style-type: none"><li>- To make students know the modern theory and methods of data modelling, their practical application possibilities, in order to be (become) able to manage large amounts of data efficiently in their own research.</li><li>- Data modelling, general aspects of modelling, levels of database planning, planning methods and tools, SQL.</li></ul> |                        |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                    |                        |
| Ullman – Widom: Database systems, Pearson – Prentice Hall, Upper Saddle River, New Jersey 07458,<br>e.g. <a href="https://people.inf.elte.hu/kiss/DB/ullman_the_complete_book.pdf">https://people.inf.elte.hu/kiss/DB/ullman_the_complete_book.pdf</a>                                                                                                                                    |                        |



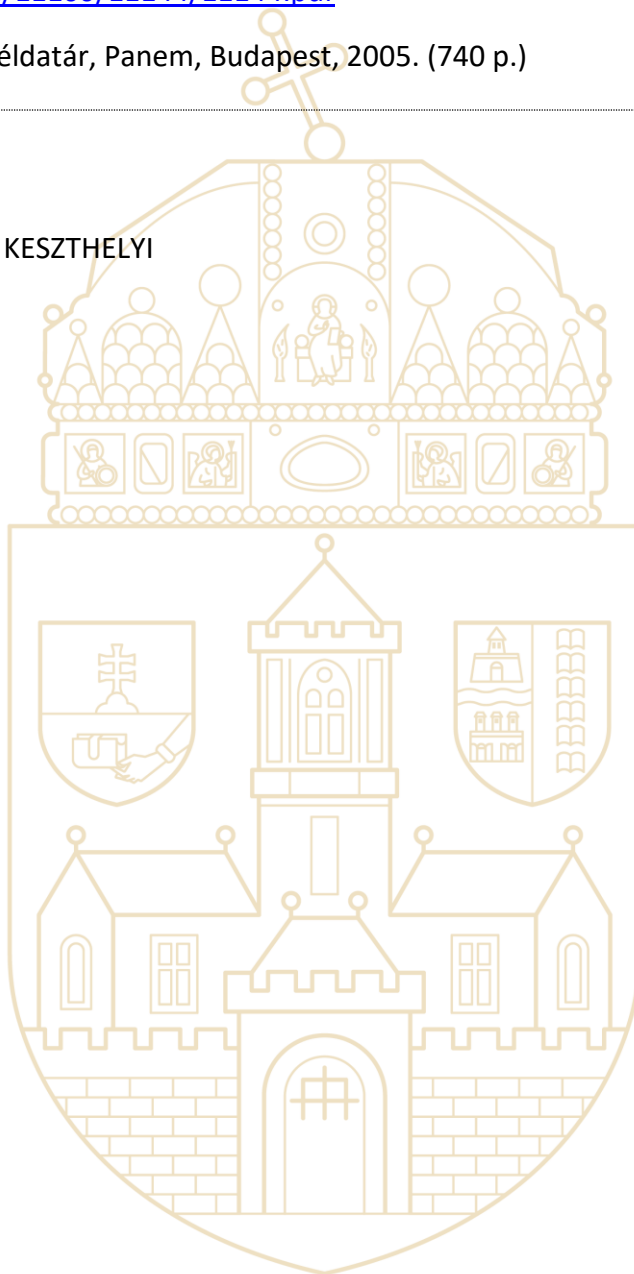
Recommended readings (textbooks, study materials):

Halassy Béla dr.: Adatmodellezés, Budapest, 2000. (300 p.)  
<https://mek.oszk.hu/11100/11144/11144.pdf>

Kende – Nagy: Oracle példatár, Panem, Budapest, 2005. (740 p.)

Date: 2025.09.15.

Prepared by: András László KESZTHELYI





## COURSE SYLLABUS

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| Course title:<br><b>Ergonomic Design of Workplaces</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>dr. habil Szabó Gyula</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory – 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: 30 classes<br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Interpretation of legislation and standards, case study analysis, risk assessment practice, project work.                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br><br>Additional (specific) methods of knowledge assessment:<br>Students are required to carry out an ergonomic analysis of a workplace related to their research area and propose possible improvements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| <b>Course description:</b> <ul style="list-style-type: none"><li>• The aim of the course is to provide students with the knowledge and skills necessary to apply ergonomic principles in the design of workplaces.</li><li>• The course introduces the physical, cognitive, and organizational aspects of ergonomics, and the design processes for safe and efficient workplaces. Special attention is given to ergonomic standards (e.g., ISO 26800:2011, ISO 9241 series), risk assessment methods, and the evaluation of workplace interventions.</li><li>• Students will learn to use both traditional and digital tools for ergonomic analysis, including workplace modeling and task evaluation, and will gain practical experience through project assignments.</li></ul> |                        |



**Required readings (textbooks, study materials):**

ISO 26800:2011 Ergonomics – General approach, principles and concepts  
ISO 9241 standards (selected parts) – Ergonomic requirements for human-system interaction  
International Labour Office, in collaboration with the International Ergonomics Association  
(2010): Ergonomic Checkpoints: Practical and Easy-to-Implement Solutions for Improving  
Safety, Health and Working Conditions. 2nd edition. ILO, Geneva  
Legal regulations and standards processed during the course

**Recommended readings (textbooks, study materials):**

Ricardo, P. Arciniega-Rocha; Vanessa, C. Erazo-Chamorro; Szabó, Gyula: The Prevention of  
Industrial Manual Tool Accidents Considering Occupational Health and Safety, SAFETY 9:  
3 pp. 2-18. Paper: 51, 17 p. (2023)  
Ricardo, P. Arciniega-Rocha; Vanessa, C. Erazo-Chamorro; Phetsalath, Phimmavong; Szabo,  
Gyula, Revolutionizing cleaning: The future of broomstick and dustpan design, Journal of  
Civil Engineering and Environmental Sciences 9: 2 pp. 073-078. , 6 p. (2023)

Budapest, 21 August, 2025

Prepared by: dr. habil Gyula Szabó





## COURSE SYLLABUS

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| Course title:<br><b>"EUFUNCTION": The Focal Points of European Integration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Tibor Babos Ph.D.</b> , Honorary Professor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>80% theory – 20% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Type of class: <u>lecture</u> / seminar / practice / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br><br>Methods and (specific) approaches, characteristics used to deliver the course content: The course is delivered through theoretical lectures, analysis of historical and contemporary case studies, research presentations, and interactive evaluation of European security policy decisions. The methodology aims to develop strategic vision and a deep understanding of complex interrelations within European and transatlantic security. |                        |
| Form of assessment: <u>exam</u> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>Students are required to <b>prepare a presentation and a written analytical paper</b> on a selected European security policy issue or capability development process. The highest mark may be awarded for a paper resulting in a related publication.                                                                                                                                                                                                          |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Prerequisites (if any): None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| <b>Course description</b><br><br>Europe's current historical era is characterized by the dissolution of the Soviet Union, the Warsaw Pact, and the Council for Mutual Economic Assistance (CMEA), as well as by democratization following German reunification and the concurrent consolidation of dynamic integration and disintegration forces. The course examines both historical and contemporary European integration and disintegration processes, with particular focus on the institutional,                                                                                     |                        |



political, and security functions of the European Union and NATO.

It analyzes the evolution of the European security architecture, the dynamics of EU–transatlantic cooperation, and the strategic implications of supranational and supernational phases of development. The emphasis is placed on integration as a continuous process—on the transformation of the EU–NATO relationship, the emergence of a new European security environment, and the interpretation of the “EU-function” as a key factor of continental stability.

Students will gain insight into the functional relationship between the EU and NATO, the interdependence among political, economic, and military dimensions, and the dialectic between integration strategies and the interests of aspirant states.

The aim of the course is to enable students to form a comprehensive, critical, and strategic understanding of the current state of European unity, cohesion, and integration, as well as its future directions within the global security environment.

**Required readings** (textbooks, study materials):

Babos, T. (2021): The European Security Architecture and Power Projection. Biztonságtudományi Központ Kiadó, Budapest.

Kiss, J. L. – Sárvári, G. (2023): European Security in Flux: Strategic Autonomy and Transatlantic Relations. Routledge.

Babos, T. (2007): Az európai biztonság öt központi pillére. Zrínyi Kiadó, Budapest. ISBN 978-9633274528.

Biscop, S. (2021): European Strategy in the 21st Century: New Future for Old Europe. Routledge.

NATO (2023): Strategic Concept – Madrid Summit 2022. NATO Public Diplomacy Division.

**Recommended readings** (textbooks, study materials):

Babos, T. (2020): Military Capability Development in Europe: Between Cooperation and Competition. Nemzet és Biztonság, Budapest.

Freedman, L. (2022): Command: The Politics of Military Operations from Korea to Ukraine. Penguin Press.

Babos, T. (2011): Globális közös terek a NATO-ban. Nemzet és Biztonság, Budapest.

Howorth, J. (2020): Security and Defence Policy in the European Union. Palgrave Macmillan.

EEAS (2022): EU Strategic Compass for Security and Defence. European Union External Action Service.

19 October 2025

Tibor Babos (Ph.D.)



## COURSE SYLLABUS

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Firefighter Interventions in Extreme Conditions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. László Bérczi PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>60% theory - 40% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Type of class: lecture / <b><u>seminar</u></b> / practice / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: In addition to the theoretical processing of knowledge, students process, present and discuss case studies in seminar sessions.                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Additional (specific) methods of knowledge assessment: written test, seminar presentation and performance evaluation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Curricular placement of the course: <b>Can be taken in semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Objective of the course: Theoretical and practical acquisition of knowledge related to the procedural, personal and technical conditions of firefighting interventions in extreme conditions.<br>Course description: <ul style="list-style-type: none"><li>- Concept, content, procedure, place and role of firefighting interventions in extreme conditions in the system of general firefighting intervention (technical rescue).</li><li>- Description of legal and internal regulations affecting firefighting interventions in extreme conditions. Organizational characteristics of interventions.</li><li>- Regulatory, procedural and methodological conditions of firefighting tactics. Firefighting and technical rescue in underground garages, underground facilities and in the</li></ul> |                        |



presence of hazardous materials.

- Personal and technical conditions for safe firefighting intervention. Innovative solutions in the field of prevention, intervention and the use of technical equipment.

**Related readings** (textbooks, study materials):

- László Bérczi: The Role of Fire Protection Technical Guideline in the Protection Against Heat and Smoke Spread. Védelem Tudomány:6 : 3 pp. 32-42. 2021. ISSN: 2498-6194
- Morgan J. Hurley: SFPE Handbook of Fire Protection Engineering, 2016., ISBN: 978-1-4939-2564-3

**Recommended readings** (textbooks, study materials):

- Gergő Érces; László Bérczi; Sándor Rác: The effects of the actively used reactive and passive fire protection systems established by innovative fire protection methods for whole life-cycle of buildings. Műszaki Katonai Közlöny 28 : 4 pp. 47-58. 2018. ISSN: 2063-4986.
- Josef Mayr, Lutz Battran: Handbuch Brandschutzatlas, Feuertrutz, 2018., ISBN: 978-3-86235-360-6
- Csaba Csepregi: Fire Alarm Systems, Budapest, Flórián Press Kiadó, 2001., pp.: 276., ISBN: 963-005-708-5

Date: 31 January 2026

Prepared by: László Bérczi, PhD





## COURSE SYLLABUS

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| Course title:<br><b>Fuzzy Methods Supporting Decision-Making</b>                                                                                                                                                                                                                        | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Pokorádi, László</b> , CSc (technical science)                                                                                                                                                                                                   |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                     |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                              |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>case presentations and/or case study analyses |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                        |                        |
| Additional (specific) methods of knowledge assessment: making of a summary study                                                                                                                                                                                                        |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                             |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                     |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                              |                        |
| <ul style="list-style-type: none"><li>- basic concepts of risk assessment;</li><li>- risk assessment using fuzzy numbers;</li><li>- fuzzy rule-based decision models</li><li>- Fuzzy Failure Mode and Effects Analysis (FFMEA)</li><li>- Fuzzy Fault Tree Analysis (FFTA)</li></ul>     |                        |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                  |                        |
| L.A. Zadeh, Fuzzy Sets, INFOR~ATIO~ AND CONTROL 8, 338–353 (1965), DOI: 10.1016/S0019-9958(65)90241-X<br>Ross, Timothy J., Fuzzy Logic with Engineering Applications, Wiley, 2010<br>Jos'e Carlos R. Alcantud, Fuzzy Techniques for Decision Making, MDPI, 2018                         |                        |



Recommended readings (textbooks, study materials):

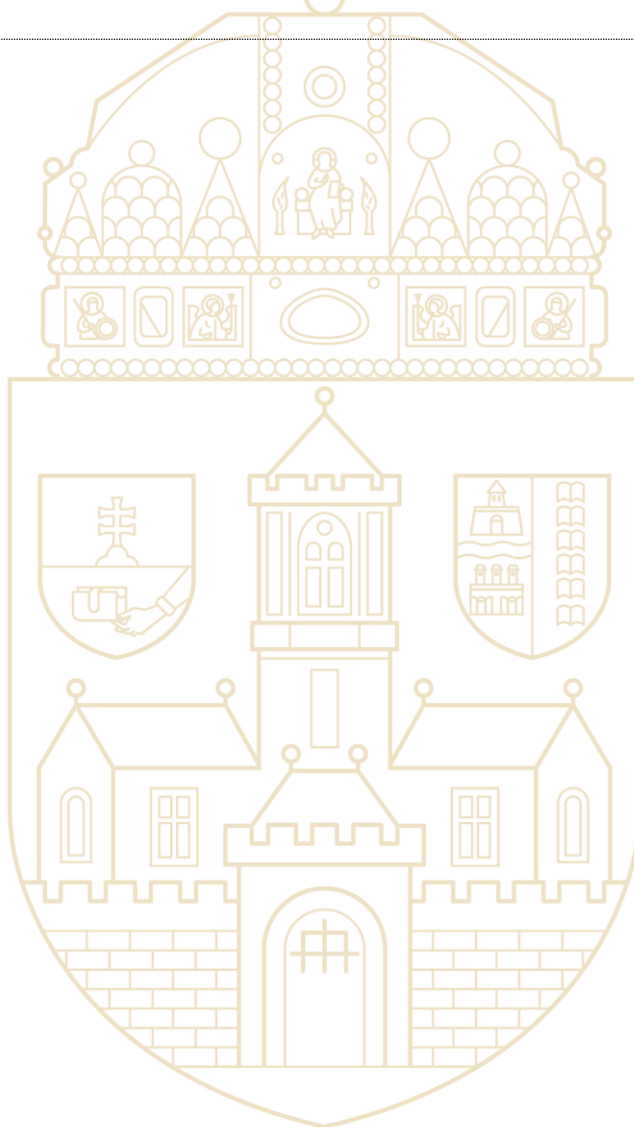
Robert Fullér, Fuzzy Reasoning and Fuzzy Optimization, Turku Centre for Computer Science, 1998. ISBN: 952-12-0283-1

Harmati, István Á. ; Coroianu, Lucian ; Fullér, Robert, The Median under Orness, FUZZY SETS AND SYSTEMS 481 Paper: 108901 , 16 p. (2024). DOI: 10.1016/j.fss.2024.108901

Csató, Péter ; Pokorádi, László, Fuzzy Rule-based Comparison of Alternative Jet Fuels, PERIODICA POLYTECHNICA TRANSPORTATION ENGINEERING 53 : 1 pp. 21-30. DOI: 10.3311/PPtr.37138

Date: 15.09.2025.

Prepared by: Porádi, László





## COURSE SYLLABUS

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| Course title:<br><b>International Humanitarian Organizations</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Sáfár Brigitta PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                 |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: case presentations and case study analyses                                                                                                                                                                                                   |                        |
| Form of assessment (exam / <b><u>practical grade</u></b> / other):<br><br>Additional (specific) methods of knowledge assessment: <b>presentation</b>                                                                                                                                                                                                                                                                                                                                |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| <b>Course description:</b><br><br>Course objective: to familiarize students with the standards and guidelines that form the basis for the coordinated and effective operation of international humanitarian aid. Students will learn how humanitarian organizations can contribute to reducing the impact of risk factors, what response systems they operate to help populations affected by disasters and emergencies, and what characteristics make them suitable for this task. |                        |
| Required readings (textbooks, study materials):<br><br>ICRC (2019) In: Melzer N., Kuster E. International Humanitarian Law. ICRC, Geneva, 2019. ISBN 978-2-940396-75-7<br>Sphere Association. The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response, fourth edition, Geneva, Switzerland, 2018. ISBN 978-1-908176-707 PDF                                                                                                                        |                        |



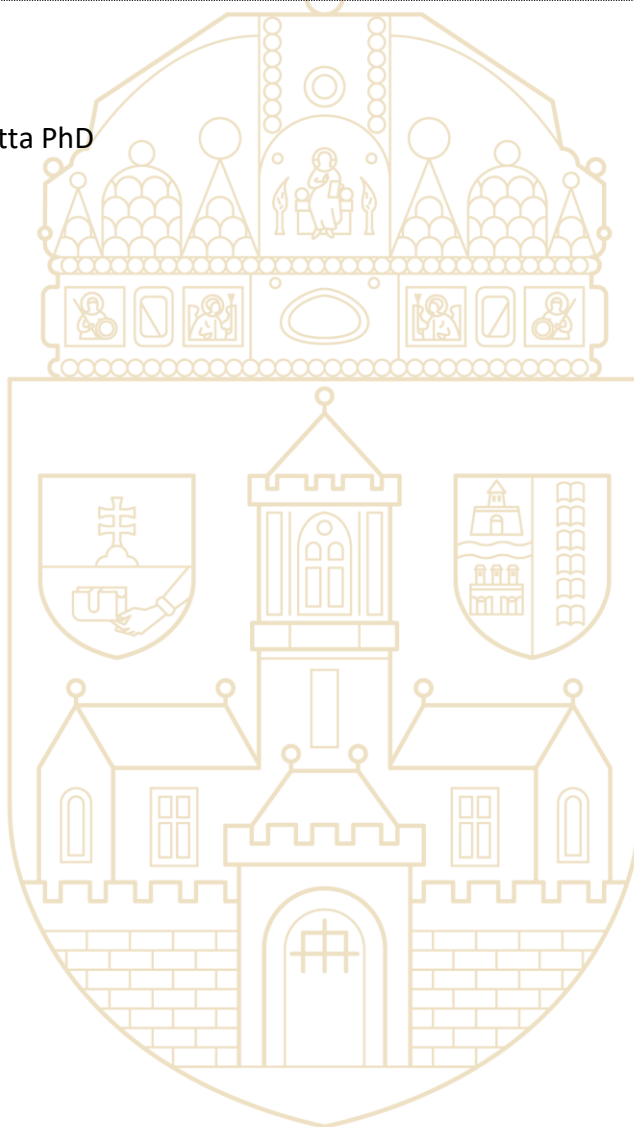
Recommended readings (textbooks, study materials):

EU Civil Protection and Humanitarian Aid (2023). Sendai Framework for Disaster Risk Reduction. Midterm Review. Luxembourg: Publications Office of the European Union, 2023. ISBN 978-92-68-03989-2

United Nations Office for Disaster Risk Reduction (2025). Global Assessment Report on Disaster Risk Reduction 2025: Resilience Pays: Financing and Investing for our Future. Geneva. ISBN 9789211576740

Date: 13. September, 2025.

Prepared by: Dr. Sáfár Brigitta PhD





## COURSE SYLLABUS

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| Course title:<br>Long-term corporate success - A secure company                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. Katalin Takács-György</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>30% theory - 70% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Additional (specific) methods of knowledge assessment:<br>Case study on a chosen topic related to the research topic of the student.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| <p>The aim of the course is to explore business and risk in business life from a holistic point of view; relations to their environment along with their internal processes. The general characteristics, such as the work and power structures, business functions of organizations, questions of resource management from wider aspect, value creating processes and financial aspects of investment strategies and general operations are also discussed.</p> <p>Also important to discuss the specifics and risks of the operation and management of organizations in addition to the general managerial knowledge necessary for the management and management of organizations. They should be able to interpret the role of innovation in value-creating processes in relation to management topics. The aim is to explore the role of human resources in the safe operation of companies.</p> <p>The questions of the strategic planning of small and medium-sized companies, the application</p> |                        |



and development of modern methods and procedures related to strategic and change management are of both micro- and macro-economic importance. However, these topics are particularly important at the level of individual economic actors (companies, employees, ...), since long-term corporate success is the key to the security of existence for those affected by the company's operation. By examining the new trends in strategic planning and management – change and innovation management – factors affecting organizational safety in the long term are presented and discussed. The innovation capacity of companies is evaluated along the lines of the expression of Schumpeterian innovation, so in addition to product innovation capacity, the ability to innovate technologically, organizationally and in the market is examined; the aim is to explore the inhibiting and supporting factors through empirical studies. The research is methodological support for the development of innovation strategies, with particular attention to the sectoral characteristics (services, industrial production, agricultural production). One direction of the research is the investigation of what factors influence the diffusion of innovation in individual sectors. The subject affects several aspects of organizational culture, since one of the elements of success is human resources.

**Required readings** (textbooks, study materials):

Hisrich, R.D., Peters, M.R. and Shepherd, D.A. (2020) Entrepreneurship. 11th Edition, McGraw Hill, New York. [www.mhhe.com](http://www.mhhe.com) p. 603.

Palalic R., Hisrich R.D., Dana L.P., Ramadani V. (2022): Sustainability of global and international business operations during the adversity and hardship. Heritage and Sustainable Development *Original Research* Vol. 4, No. 1, January 2022, pp.18-26  
<https://doi.org/10.37868/hsd.v4i1.78>

Business Environment and Organizational Activities Report (Assessment). Exclusively available on IvyPanda®.

**Recommended readings** (textbooks, study materials):

Lafuente E., Ács Z.J., Sanders, M., Szerb L. (2021): Correction to: The global technology frontier: productivity growth and the relevance of Kirznerian and Schumpeterian entrepreneurship. Small Bus Econ (2020) 55:153–178 <https://doi.org/10.1007/s11187-019-00140-1>

Dewhurst J.A. (2014): An Introduction to Business and Business Planning. Free ebook at [bookboon.com](http://bookboon.com) 1st Edition. p. 123

Date: 25 August, 2025.

Prepared by: Dr. Takácsné Prof. Dr. György Katalin



## COURSE SYLLABUS

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Mathematical tools of motion analysis in biomechanics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. István BÍRÓ</b> , full professor, PhD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50%theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: <ul style="list-style-type: none"><li>– Overview of the mathematical tools of motion analysis applied in biomechanics, partly in the form of a lecture, partly in the form of an independent analysis.</li><li>– Solving a project task related to the student's research topic.</li><li>– Analysis of publications with similar content.</li></ul> |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment:<br>The success of the above work is also included in the results of the colloquium.                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Aim of the course:<br>The aim of the course is the deeper understanding of the biomechanics of human motion in sports and rehabilitation. During the investigation of different human motion, processing of a large number of kinematical data is necessary. Different type of motion capture systems, equipments and methods such as optical, electromagnetic and image-based techniques can be applied. For deeper investigation, the processing of measured data is necessary to                                                                                                                      |                        |



calculate various special kinematic and kinetic parameters. In these cases, the application of special mathematical tools is indispensable.

**Course description:**

Review and analytical evaluation of different mathematical tools can be applied motion analysis. The 2nd part of the content of the course is the application of some reviewed and evaluated mathematical tools in own research topic.

**Required readings (textbooks, study materials):**

Iwan W. Griffiths: Principles of biomechanics & motion analysis. Lippincott Williams & Wilkins, 2006, ISBN 0-7817-5231-0, 2006

Jaehwang Seol, Kicheol Yoon and Kwang Gi Kim: Mathematical Analysis and Motion Capture System Utilization. Method for Standardization Evaluation of Tracking Objectivity of 6-DOF Arm Structure for Rehabilitation Training Exercise Therapy Robot, Diagnostics, 2022, 12, 3179. [https://doi.org/ 10.3390/ diagnostics12123179](https://doi.org/10.3390/diagnostics12123179)

**Recommended readings (textbooks, study materials):**

Duane Knudson: Fundamentals of Biomechanics, 2nd Edition, Springer, 2007, ISBN 978-0-387-49311-4.

Vladimir M. Zatsiorsky: Kinetics of Human Motion, ISBN: 9780736037785, 2002.

Bíró István, Fekete Gusztáv: Approximate Method for Determining the Axis of Finite Rotation of Human Knee Joint, ACTA POLYTECHNICA HUNGARICA 11:(9) pp. 61-74. (2014).

G Fekete, B M Csizmadia, M A Wahab, P Baets, L Vanegas-Useche, I Biro: Patellofemoral Model of the Knee Joint Under Nonstandard Squatting, DYNA-COLOMBIA 81:(183) pp. 60-67. (2014).

István Bíró, Béla M. Csizmadia, Gábor Katona: Sensitivity investigation of three-cylinder model of human knee joint, BIOMECHANICA HUNGARICA 3:(1) pp. 33-42. (2010).

Date: 11/09/2025

Prepared by: Prof. Dr. István Bíró



## COURSE SYLLABUS

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Measurement of Non-Electrical Quantities</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. József Sárosi</b> , full professor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Type of class: <b><u>lecture</u></b> / seminar / <b><u>practice</u></b> / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Case presentations and case study analyses, project work, taking measurements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Form of assessment: exam / practical grade / <b><u>other</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Additional (specific) methods of knowledge assessment: assignment, case study presentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| <ul style="list-style-type: none"><li>- Most quantities to be measured are non-electrical such as temperature, pressure, displacement, humidity, fluid flow, etc., but these quantities cannot be measured directly. Hence such quantities are required to be sensed and changed into some other form of quantities. Therefore, for measurement of non-electrical quantities these are to be converted into electrical quantities. During the course the principles and practice of electrical instruments for the measurement of non-electrical quantities are presented and investigated.</li><li>- Introduction to measurement. Instrument types and performance characteristics. Errors during the measurement process. Bridge circuits. Measurement sensors and instruments. Study of the measurement of different non-electrical quantities through electrical methods.</li></ul> |                        |



**Required readings (textbooks, study materials):**

Ekbert Hering - Gert Schönfelder: Sensors in Science and Technology, Springer, 2022, 835 p., ISBN 978-3-658-34920-2

S. P. Venkateshan: Mechanical Measurements, Springer, 2022, 570p. ISBN 978-3-030-73619-4

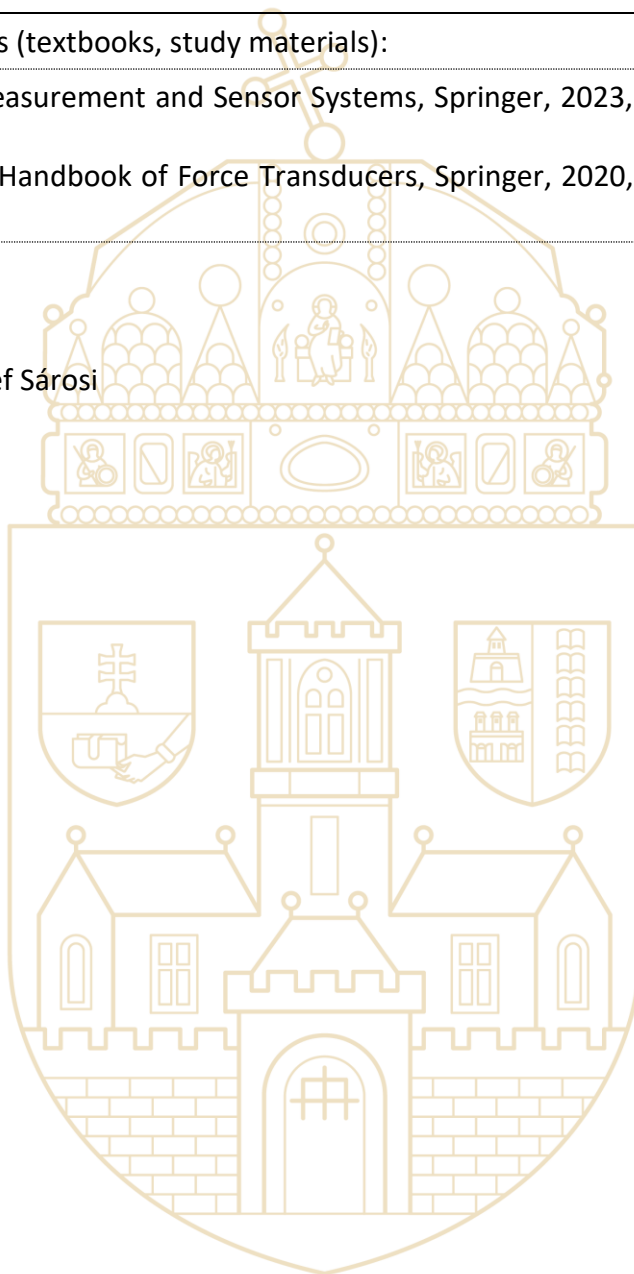
**Recommended readings (textbooks, study materials):**

Alexander W. Koch: Measurement and Sensor Systems, Springer, 2023, 253 p., ISBN 978-3-031-15869-8

Dan Mihai Ștefănescu: Handbook of Force Transducers, Springer, 2020, 257 p., ISBN 978-3-030-35321-6

Date: 13/09/2025

Prepared by: Prof. Dr. József Sárosi





## COURSE SYLLABUS

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Modelling of Technical Systems</b>                                                                                                                                                                                                                                                                                  | Credit value: <b>6</b> |
| Course responsible and lecturer (name, academic title):<br><b>Pokorádi, László, CSc (technical science)</b>                                                                                                                                                                                                                             |                        |
| Course classification: Basic course (subjects) in the field of safety and security science/<br>Research topic related basic course / Optional subject                                                                                                                                                                                   |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                              |                        |
| Type of class: lecture / seminar / practice / <b>consultation</b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: case presentations and/or case study analyses                                                           |                        |
| Form of assessment: exam / <b>practical grade</b> / other                                                                                                                                                                                                                                                                               |                        |
| Additional (specific) methods of knowledge assessment: making of a summary study                                                                                                                                                                                                                                                        |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                             |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                     |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                              |                        |
| <ul style="list-style-type: none"><li>- classification of mathematical models;</li><li>- modeling methods;</li><li>- dimensional analysis;</li><li>- single- and multi-parameter sensitivity analysis;</li><li>- correlation-family analysis;</li><li>- state estimation methods.</li></ul>                                             |                        |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                  |                        |
| System Book, <a href="http://sysbook.sztaki.hu/">http://sysbook.sztaki.hu/</a> ;<br>Pokorádi, László, Szabolcsi, Róbert, Mathematical Models Applied to Investigate Aircraft Systems, nomográfia, Monographical Booklets in Applied and Computer Mathematics, MB-12, PAMM, Műegyetemi Kiadó, Budapest, 1999., pp. 146. ISBN: 9634206514 |                        |



Heinz, "Mathematical Modeling" Springer Heidelberg Dordrecht London New York, 2011.  
ISBN: 978-3-642-44388-6

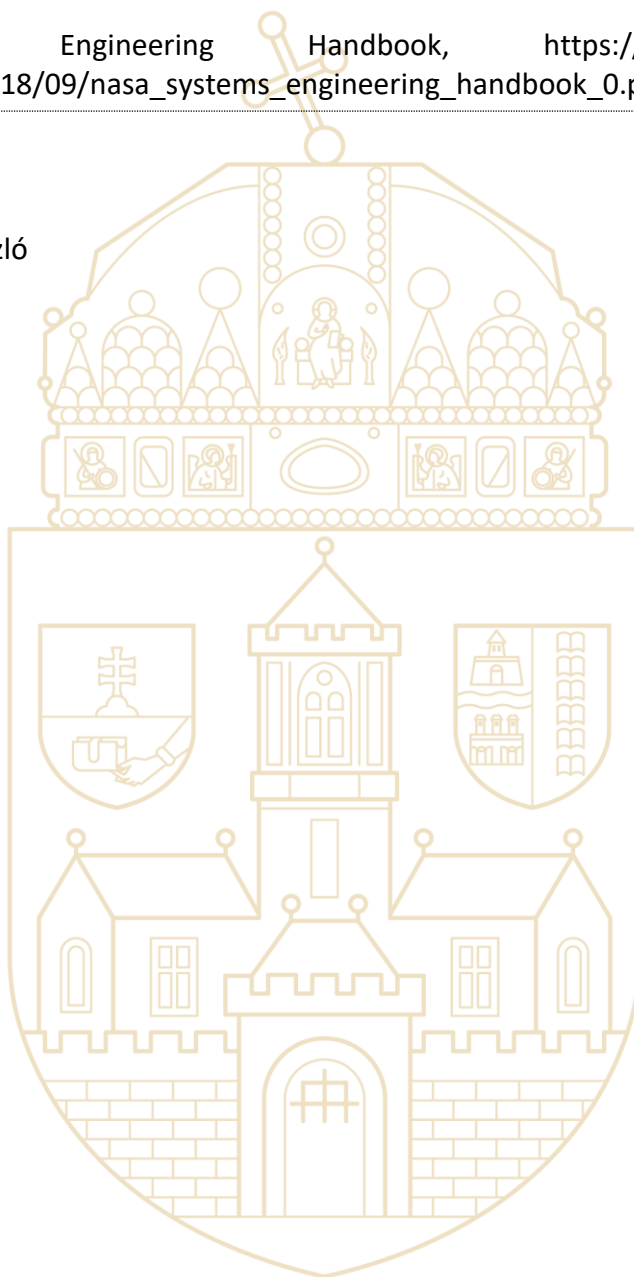
Recommended readings (textbooks, study materials):

Dagpunar, J. S. (2007), Simulation and Monte Carlo, John Wiley & Sons Inc. ISBN: 978-0-470-85494-5

NASA Systems Engineering Handbook, [https://www.nasa.gov/wp-content/uploads/2018/09/nasa\\_systems\\_engineering\\_handbook\\_0.pdf](https://www.nasa.gov/wp-content/uploads/2018/09/nasa_systems_engineering_handbook_0.pdf)

Date: 15.09.2025.

Prepared by: Pokorádi, László





## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Modern statistical methods in Research</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. Andrea Tick</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>40% theory - 60% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Type of class: <b><u>lecture</u></b> / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: <ul style="list-style-type: none"><li>- Lectures: partly e-learning, partly face-to-face lectures</li><li>- Practical work: case studies and case study analysis, practical examples using software, software analysis of unknown data sets, software analysis of own research data</li></ul>                                                                                                                                                                                                                                           |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Additional (specific) methods of knowledge assessment: <b>written assignments, one publication</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| <p>Within the framework of the subject, students receive an overview of the scientifically sound research process, the development of the research plan, the individual research methods and the possibilities of data collection and validation. The aim of the subject is also to present the repository of statistical methods and the procedures that can be applied in research. A great emphasis is placed on meeting the expectations of scientific research in every step of the whole research process, from data collection through model design and building to the evaluation of the results.</p> <p>Research planning. Primary research methods (experiment, questionnaire survey, focus group research). Secondary research methods. Development of the principles of data</p> |                        |



collection, examination of data sources (measurement methods and data types, definition of variables), review of sampling procedures, development of rules, procedures (sample size). Settlement of the legal background for data collection (GDPR). Data validation. Types and forms of analysis, methods used for analysis, test methods offered by statistics, application of modern statistical analysis software, univariate, crosstab, ANOVA, factor analysis. Methods and possibilities of correlation and regression calculation, discriminant analysis and logistic regression. Use of computer software specialized in quantitative data analysis, effective application of Power BI, SAS and SPSS in the analysis and evaluation process, the potential so AI for statistical analysis. Examples, case studies.

**Required readings (textbooks, study materials):**

Mohr, Donna L., William J. Wilson, and Rudolf J. Freund. Statistical Methods. Elsevier, 2021, p.784, ISBN 978-0-12-823043-5

Fein, Erich, John Gilmour, Tanya Machin, and Liam Hendry. Statistics for Research Students: An Open Access Resource with Self-Tests and Illustrative Examples. University of Southern Queensland, 2022. p.109, <https://doi.org/10.26192/q7985>, ISBN 9780645326109, <https://usq.pressbooks.pub/statisticsforresearchstudents/>

Çetinkaya-Rundel, Mine, and Johanna Hardin. Introduction to Modern Statistics (2e). OpenIntro, 2024. p. 510, <https://openintro-ims.netlify.app/>, ISBN 978-1-943450-27-5

Field, Andy. Discovering Statistics Using IBM SPSS Statistics. 6th edition. Sage, Los Angeles London New Delhi Singapore Washington DC Melbourne, 2024, p.1110, ISBN: 9781529630008

Bramer, Max. Principles of Data Mining. Undergraduate Topics in Computer Science. Springer London, 2020. P. 571, ISBN 978-1-4471-7492-9 978-1-4471-7493-6, <https://doi.org/10.1007/978-1-4471-7493-6>

**Recommended readings (textbooks, study materials):**

Szűcs, Kata Rebeka, Andrea Tick, and Regina Zsuzsanna Reicher. "Applying Attitude Theory to Determine User Security Approaches." Serbian Journal of Management 19, no. 1 (2024): 133–48. <https://doi.org/10.5937/sjm19-45280>.

Tick, Andrea. "Evaluation of Industry 4.0 Familiarity at SMEs in Central-Eastern Europe Using Machine Learning Algorithms." 2023 IEEE 17th International Symposium on Applied Computational Intelligence and Informatics (SACI), IEEE, May 23, 2023, 000643–48. <https://doi.org/10.1109/SACI58269.2023.10158645>.

Tick, Andrea. "Industry 4.0 Narratives through the Eyes of SMEs in V4 Countries, Serbia and Bulgaria." Acta Polytechnica Hungarica 20, no. 2 (2023): 83–104. <https://doi.org/10.12700/APH.20.2.2023.2.5>.

Parr-Rud, Olivia. Business Analytics Using SAS Enterprise Guide and SAS Enterprise Miner: A Beginner's Guide. SAS Institute Inc, 2014. p.168, ISBN 978-1-62959-327-2

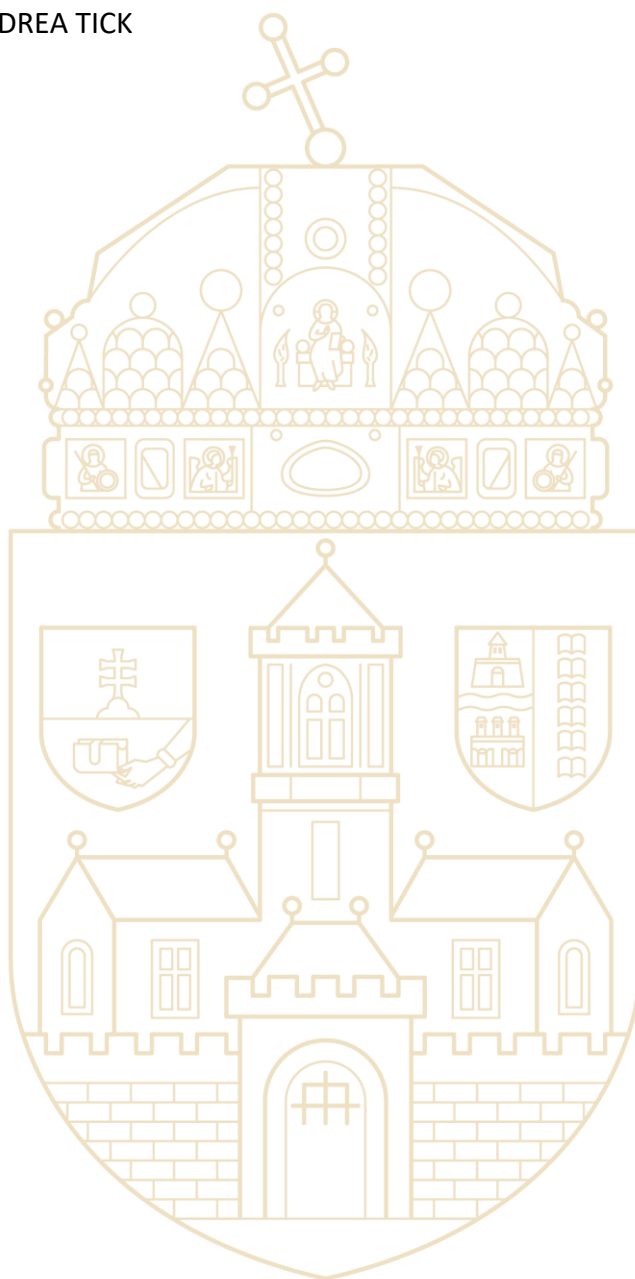
Cody, Ronald P. Biostatistics by Example Using SAS Studio. 1st ed. SAS Institute, Cary, NC, 2016, p.262, ISBN 978-1-62960-493-0



Ott, Lyman, and Michael Longnecker. An Introduction to Statistical Methods & Data Analysis.  
Seventh edition. Cengage, 2020, p.1174, ISBN 978-0-357-67062-0

Date: 10 September 2025

Prepared by: PROF. DR. ANDREA TICK





## COURSE SYLLABUS

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



- tools of mathematical statistics, estimation theory, confidence intervals, hypothesis testing, goodness of fit tests, etc.

**Required readings (textbooks, study materials):**

Fletcher: Practical methods for optimization. John Wiley and Sons. 2008.  
ISBN: 978-0-471-91547-8

Luenberger: Linear and Nonlinear Programming. Springer. 2008.  
ISBN: 978-0-387-74502-2

Rao: Engineering Optimization Theory and Practice. John Wiley and Sons. 2009.  
ISBN: 978-0-470-18352-6

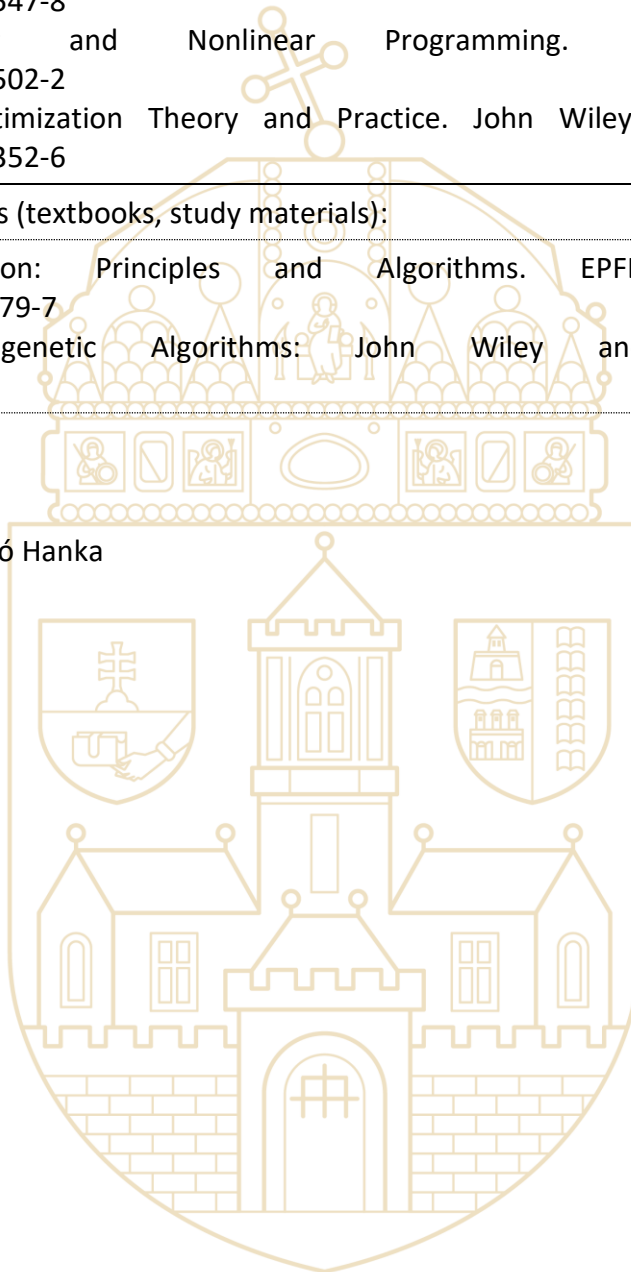
**Recommended readings (textbooks, study materials):**

Bierlaire: Optimization: Principles and Algorithms. EPFL Press. 2018.  
ISBN 978-2-88915-279-7

Haupt: Practical genetic Algorithms: John Wiley and Sons. 2008.  
ISBN 0-471-45565-2

Date: 01.09.2025.

Prepared by: Dr. habil László Hanka





## COURSE SYLLABUS

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Practical Biometrics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Ózsi Arnold</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                           |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Lectures, consultations, case presentations, and case study analyses.                                                                                                                                                                                                               |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Additional (specific) methods of knowledge assessment: Individual student work                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Students will gain knowledge of the characteristics and main types of biometric devices, as well as their applicability in real-world scenarios: why and to what extent different biometric devices deviate from their specifications, and for which tasks they can be optimally used. Through laboratory sessions and practical applications, students will acquire knowledge and hands-on experience with fingerprint, hand geometry, facial recognition, iris, palm vein, finger vein, and complex identification systems. |                        |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Almuwayziri, S.; Al-Nafjan, A.; Aljumah, H.; Aldayel, M. Deep Learning-Based Fingerprint–Vein Biometric Fusion: A Systematic Review with Empirical Evaluation. Appl. Sci. 2025, 15, 8502.<br><a href="https://doi.org/10.3390/app15158502">https://doi.org/10.3390/app15158502</a>                                                                                                                                                                                                                                            |                        |



Shadman, R.; Hou, D.; Hussain, F.; Murshed, M.G.S. Explainable Face Recognition via Improved Localization. *Electronics* 2025, 14, 2745.  
<https://doi.org/10.3390/electronics14142745>

Kang, G.; Park, J.; Kim, Y.-G. Continuous Behavioral Biometric Authentication for Secure Metaverse Workspaces in Digital Environments. *Systems* 2025, 13, 588.  
<https://doi.org/10.3390/systems13070588>

Meng, H.; Zhang, L.; Yang, F.; Hai, L.; Wei, Y.; Zhu, L.; Zhang, J. Livestock Biometrics Identification Using Computer Vision Approaches: A Review. *Agriculture* 2025, 15, 102.  
<https://doi.org/10.3390/agriculture15010102>

EL Fadel, N. Facial Recognition Algorithms: A Systematic Literature Review. *J. Imaging* 2025, 11, 58. <https://doi.org/10.3390/jimaging11020058>

Recommended readings (textbooks, study materials):

Al-Nafjan, A.; Alahaideb, L.; Aldayel, M.; Aljumah, H. EEG-Based Authentication Across Various Event-Related Potentials (ERPs). *Sensors* 2025, 25, 4962.  
<https://doi.org/10.3390/s25164962>

Zhang, Z.; Liu, P.; Su, C.; Tong, S. A High-Speed Finger Vein Recognition Network with Multi-Scale Convolutional Attention. *Appl. Sci.* 2025, 15, 2698.  
<https://doi.org/10.3390/app15052698>

Harezlak, K.; Pluciennik, E. Towards Improved Eye Movement Biometrics: Investigating New Features with Neural Networks. *Sensors* 2025, 25, 4304.  
<https://doi.org/10.3390/s25144304>

Date: 2025.08.15.

Prepared by: Dr. Ószi Arnold



## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Problems of safe scaling of adaptive and robust control of nonlinear dynamic systems</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. József Tar DSc</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Type of class: lecture / seminar / <b><u>practice</u></b> / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: What methods, (specific) ways and characteristics are used to transfer the given knowledge: overview of the model structure of robots as dynamic systems with a theoretical foundation; the method of incorporating the proposed special adaptive control into the available dynamic model; formulation and convergence of kinematic expectations; the possibility and modes of convergence of the adaptive method; issues of parameter estimation and the significance of the estimation;<br>with laboratory exercises: sequential Julia language-based basic programs for different kinematic requirements in the case of a special dynamic model; presentation of a model library for different dynamic models; the student creatively reworks the chosen kinematic basic program for the case of another dynamic model. |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment: In addition to the classic colloquium, the operation of the methods in question can be discussed through the parameter settings of the developed program.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                        |



**Course description:**

- Understanding the structure and uses of dynamic (typically robotic) models in dynamic control.
- Understanding the important differences between adaptive controls based on the Lyapunov function and the Banach theorem.
- Learning to simulate the control of dynamic systems through simple sequential codes.
- Investigating the impact of complex effects of control parameters and approximate dynamic models using simulation.

**Required readings (textbooks, study materials):**

- B. Armstrong, O. Khatib and J. Burdick. The Explicit Dynamic Model and Internal Parameters of the PUMA 560 Arm. Proc. IEEE Conf. On Robotics and Automation 1986, 1986, pp. 510-518, doi = 10.1109/ROBOT.1986.1087644, url = <https://resolver.caltech.edu/CaltechAUTHORS:20190612-075818151>
- P.I. Corke and B. Armstrong-Helouvry. Proceedings of the 1994 IEEE International Conference on Robotics and Automation. "A search for consensus among model parameters reported for the PUMA 560 robot, 1994, vol. 2, pp. 1608-1613, doi = 10.1109/ROBOT.1994.351360
- J.K. Tar, J.F. Bitó, L. Náday and J.A. Tenreiro Machado. Robust Fixed Point Transformations in Adaptive Control Using Local Basin of Attraction. Acta Polytechnica Hungarica, 2009, vol. 6, no. 1, pp. 21-37
- B. Csanádi, P. Galambos, J.K. Tar, Gy. Györök, and A. Serester. 2018 IEEE International Conference on Systems, Man, and Cybernetics (SMC). "A Novel, Abstract Rotation-Based Fixed Point Transformation in Adaptive Control", 2018, pp. 2577-2582, doi = 10.1109/SMC.2018.00441
- A. Atinga and J.K. Tar. Tackling Modeling and Kinematic Inconsistencies by Fixed Point Iteration-Based Adaptive Control, Machines, vol. 11, no. 6, article number 585, 2023, url = <https://www.mdpi.com/2075-1702/11/6/585>, ISSN: 2075-1702, doi = 10.3390/machines11060585

**Recommended readings (textbooks, study materials):**

- A.M. Lyapunov. Stability of Motion. Academic Press, New-York and London, 1966.
- S. Banach. Sur les opérations dans les ensembles abstraits et leur application aux équations intégrales (About the Operations in the Abstract Sets and Their Application to Integral Equations), Fund. Math., 1922, vol. 3, pp. 133-181, url = <http://eudml.org/doc/21328>



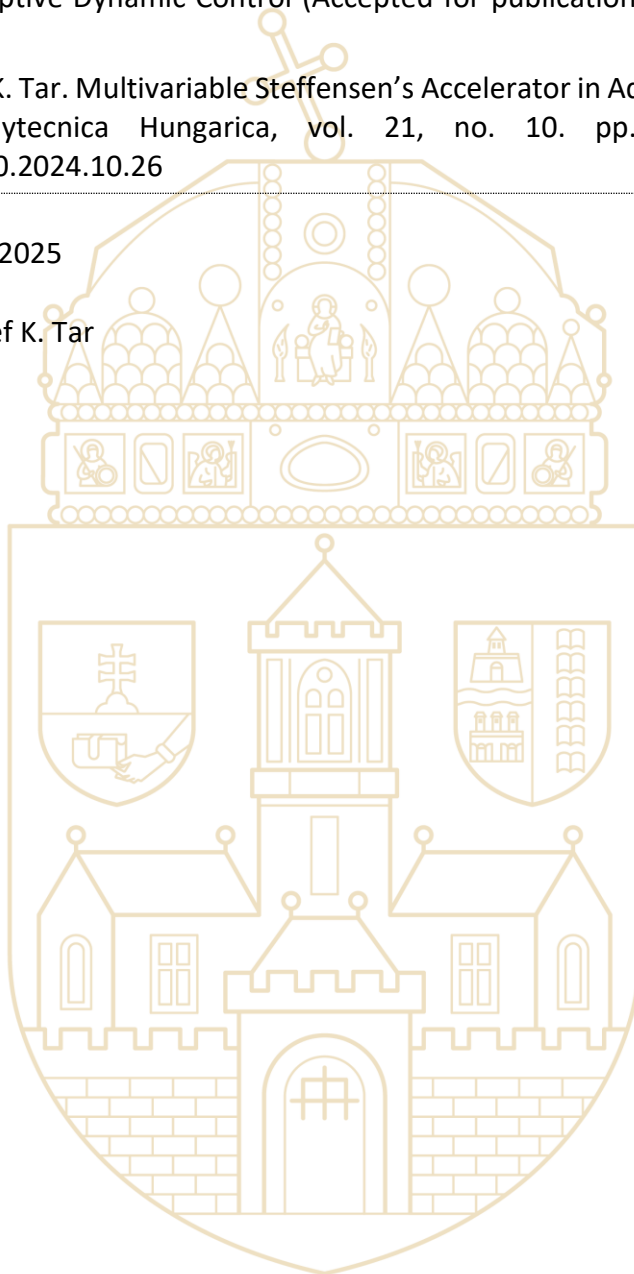
J.J.E. Slotine and W. Li. Applied Nonlinear Control, isbn=9780130400499, lccn=90033365, Prentice-Hall International Editions, url=<https://books.google.hu/books?id=HddxQgAACAAJ>, 1991, Prentice-Hall

A. Awudu, K. Kósi and J.K. Tar. Novel Metric to Quantify the Consequences of Modeling Imprecisions in Adaptive Dynamic Control (Accepted for publication), Acta Polytechnica Hungarica, 2025

A. Atinga, K. Kósi and J.K. Tar. Multivariable Steffensen's Accelerator in Adaptive Sliding Mode Control, Acta Polytechnica Hungarica, vol. 21, no. 10. pp. 413-438, doi = 10.12700/APH.21.10.2024.10.26

Date: Budapest, 17 August 2025

Prepared by: Prof. Dr. József K. Tar





## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>Programming in MATLAB</b>                                                                                                                                                                                                                                                                                                                                                                        | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Prof. Dr. Róbert Szabolcsi, DSc.</b>                                                                                                                                                                                                                                                                                                                                          |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                  |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>10% theory - 90% practice</b>                                                                                                                                                                                                                                                                                                           |                        |
| Type of class: <b><u>lecture</u></b> / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: the course starts with short introduction to MATLAB basic programming. Students bring their own scientific problems into the course to solve them using MATLAB. |                        |
| Form of assessment: <b><u>exam</u></b> / practical grade / other<br><br>Additional (specific) methods of knowledge assessment: at the end of the course students <b>deliver report</b> to the lecturer in the form of a scientific essay to be evaluated. MATLAB scripts written by the students shall be evaluated and results gained shall be validated.                                                           |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                          |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| <b>Course description:</b><br><br><ul style="list-style-type: none"><li>- MATLAB basics.</li><li>- MATLAB toolboxes.</li><li>- Solution of mathematical problems using MATLAB.</li><li>- Use of Control System Toolbox</li><li>- Use of Robust Control Toolbox</li><li>- Use of MPC toolbox. Outlook for Simulink and its toolboxes.</li></ul>                                                                       |                        |



**Required readings (textbooks, study materials):**

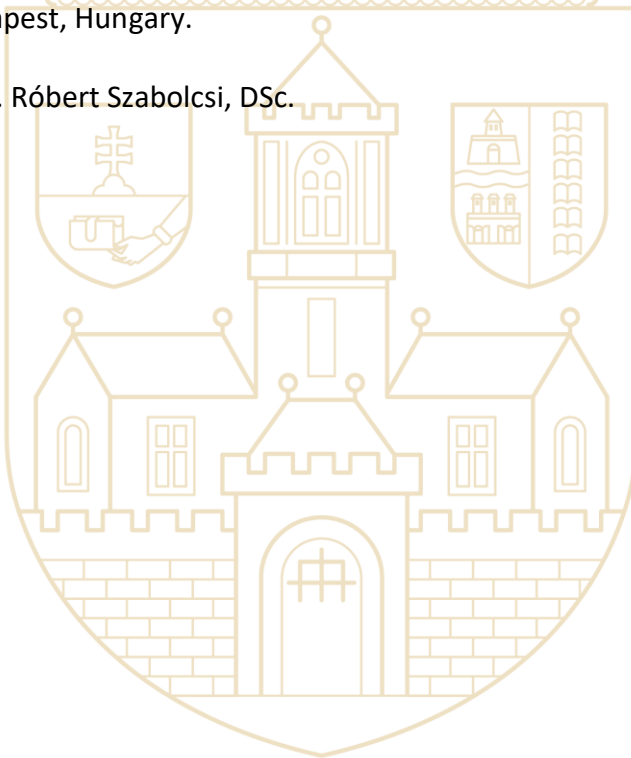
R. Szabolcsi: Conceptual and Preliminary Computer-Aided Design and Analysis of the Small UAVs Applied for Governmental Purposes, ISBN 9786150230498, 254p, Budapest, 2025.  
MATLAB 2025b, User's Guide, The MathWorks Ltd., 2025.  
R. K. Yedavalli: Flight Dynamics and Control of Aero and Space Vehicles. John Wiley & Sons, Ltd., ISBN: 978-1-118-93445-6, 2020.

**Recommended readings (textbooks, study materials):**

Jameel Al-Kamil Safa; Szabolcsi Róbert: Optimizing path planning in mobile robot systems using motion capture technology. Results in Engineering, (2590-1230 2590-1230): Vol 22 Paper 102043. 9 p., 2024.  
Al-Kamil Safa Jameel; Szabolcsi Róbert: Enhancing Mobile Robot Navigation: Optimization of Trajectories through Machine Learning Techniques for Improved Path Planning Efficiency. Mathematics (2227-7390): 12 12, pp(1787-1807), 2024.  
Ahmed Douzi; Róbert Szabolcsi; Judit Lukács: Cybersecurity and the flight safety of unmanned aerial systems and unmanned aerial vehicles Interdisciplinary Description of Complex Systems (1334-4684 1334-4676): 23 2 pp(95-104), 2025.

Date: August 28 2025, Budapest, Hungary.

Prepared by: Prof. Dr. habil. Róbert Szabolcsi, DSc.





## COURSE SYLLABUS

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| Course title:<br><b>Psychosocial Support in Emergencies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Sáfár Brigitta PhD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% - 50% theory - practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content: case presentations and case study analyses                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Additional (specific) methods of knowledge assessment: <b>presentation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| <p>Course objective: to familiarize students with the role of mental health support and psychosocial assistance programs related to disasters and emergencies, and their further impact on the psychosocial well-being of individuals and communities amid changing security challenges. Students will learn about events that affect the psychosocial well-being of individuals, individual coping strategies, and ways to restore psychosocial well-being, as well as the psychosocial needs and psychological balance of individuals, helpers, primary responders, and children as groups with special needs and vulnerabilities, as well as methods for restoring psychological balance.</p> |                        |



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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| WHO (2024). Psychological interventions implementation manual: integrating evidence-based psychological interventions into existing services. Geneva: World Health Organization; 2024. ISBN 978-92-4-008714-9<br>IFRC (2020) Guidelines for Caring for Staff and Volunteers in Crises, IFRC Reference Centre for Psychosocial Support, Copenhagen, 2020.                                                                                                                                                                                                                                                                                                                                            |
| <b>Recommended readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Sáfár B. (2024). A segítők pszichoszociális támogatása katasztrófa- és krízishelyzetekben. Polgári Védelmi Szemle. A Magyar Polgári Védelmi Szövetség és a Magyar Polgári Védelmi Tudományos Egyesület mértékadó tudományos folyóirata. XVI. évfolyam Különszám 2024. pp. 439-451. ISSN 1788-2168<br>SáfárB. (2024). A pszichoszociális reziliencia fejlesztésének lehetőségei a katasztrófák- és humanitárius krízishelyzetek érintettjeinél. Védelem Tudomány a Katasztrófavédelem Online Szakmai, tudományos folyóirata, 8(klsz). Elérés forrás: <a href="https://ojs.mtak.hu/index.php/vedelemtudomany/article/view/14877">https://ojs.mtak.hu/index.php/vedelemtudomany/article/view/14877</a> |

Date: 13. September, 2025.

Prepared by: Dr. Sáfár Brigitta PhD





## COURSE SYLLABUS

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Course title:<br><b>Requirements and quality in safety-critical automotive system design</b>                                                                                                                                                                                                                                                                                                                    | Credit value: 6 |
| Course responsible and lecturer:<br><b>Lázár-Fülep, Tímea, PhD</b>                                                                                                                                                                                                                                                                                                                                              |                 |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                             |                 |
| Proportion of theoretical and practical content, "Training character":<br><b>80% theory - 20% practice</b>                                                                                                                                                                                                                                                                                                      |                 |
| Type of class: <b><u>lecture</u></b> / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br><b>project work</b> preparation of a paper tailored to the given research area                                                                          |                 |
| Form of assessment: <b><u>exam</u></b> / practical grade / other                                                                                                                                                                                                                                                                                                                                                |                 |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                                                                                                                        |                 |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1-4</b>                                                                                                                                                                                                                                                                                                                                     |                 |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                      |                 |
| <ul style="list-style-type: none"><li>- Basic principles of automotive requirements and quality, fundamental methods, procedures focusing on safe and reliable safety-critical systems</li><li>- Applicability of qualitative and quantitative reliability analyses, the role of intelligent vehicle systems, reliability concepts for electronic systems, industrial and sector-specific regulations</li></ul> |                 |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                          |                 |
| Lázár-Fülep, Tímea: Scientific Research Review on Dependability of Complex Automotive Systems Developed towards Autonomous Driving, PERIODICA POLYTECHNICA TRANSPORTATION ENGINEERING 50:2 pp. 142-145., 4 p. (2022)                                                                                                                                                                                            |                 |



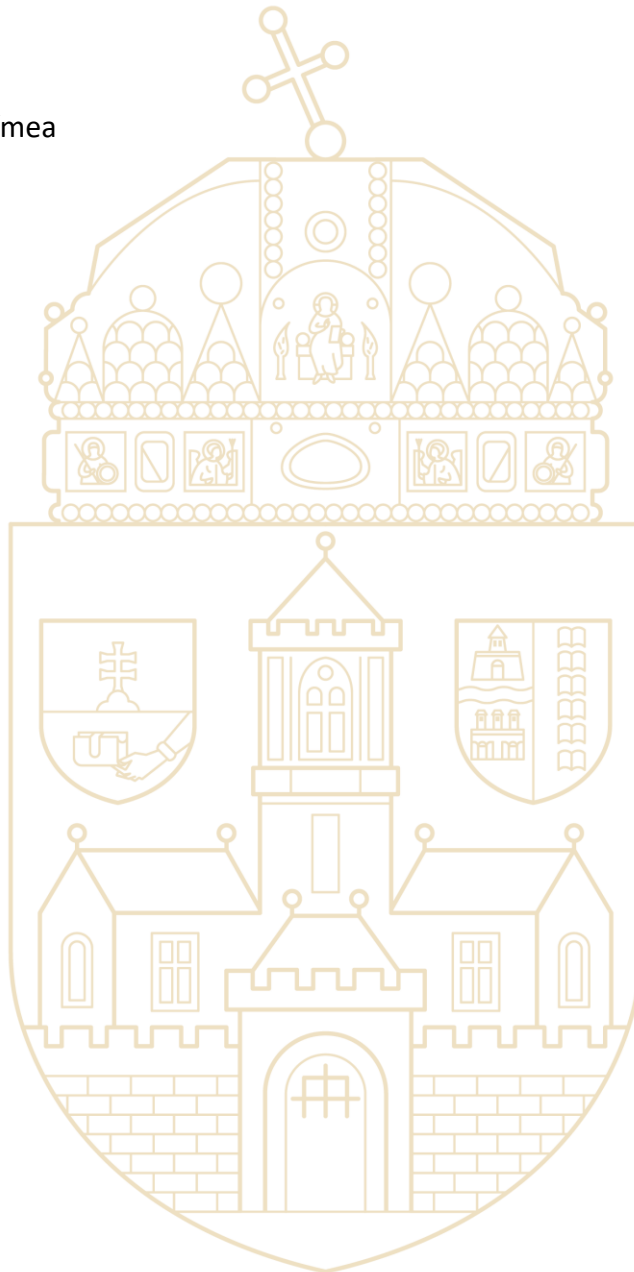
Tímea Fülep: Design Methods of Safety-Critical Electronic Automotive Systems - Quality – Requirement – Reliability, LAP Lambert Academic Publishing, 2012

Recommended readings (textbooks, study materials):

-

Date: 10 September 2025

Prepared by: Lázár-Fülep Tímea





## COURSE SYLLABUS

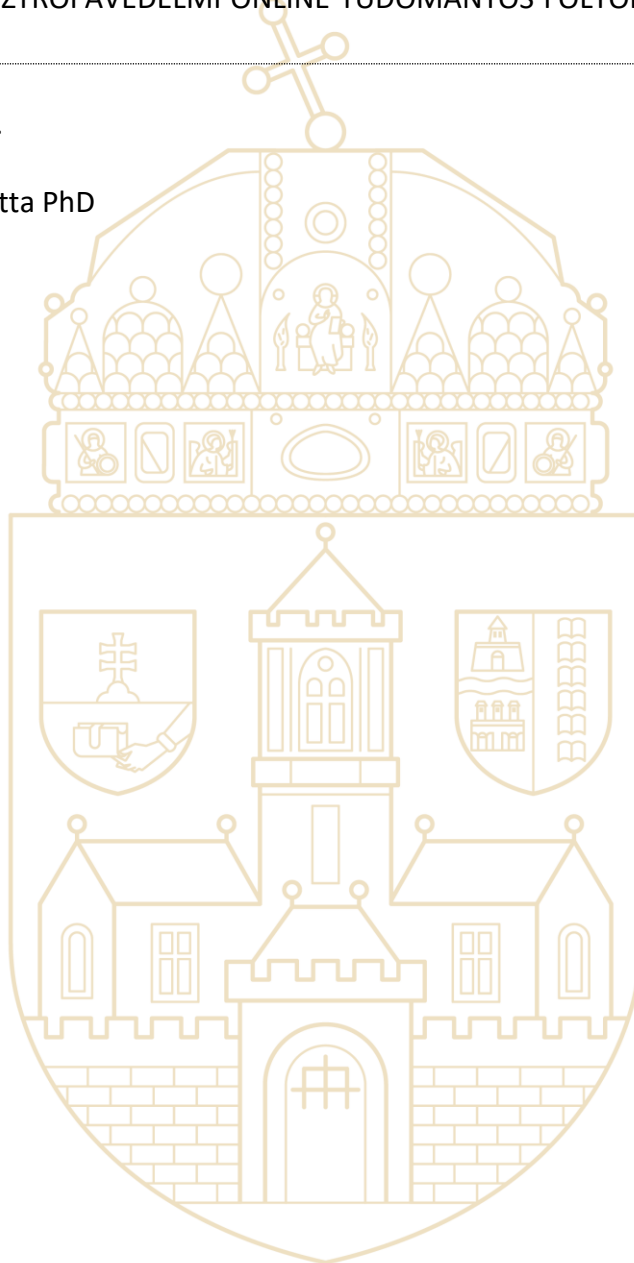
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title: <b>Resilience in Emergencies</b>                                                                                                                                                                                                                                                                                                                                                                                                     | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Dr. Brigitta Sáfár PhD</b>                                                                                                                                                                                                                                                                                                                                                                                  |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                         |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>case presentations and case study analyses                                                                                                                                                               |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                   |                        |
| Additional (specific) methods of knowledge assessment: <b>presentation</b>                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                        |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Course objective: to familiarise students with the concept of resilience, its characteristics, the programmes that serve it, and how governmental and non-governmental organisations can contribute to its development. Students will learn about the characteristics of resilience at the individual, community, organisational and global levels, as well as its criteria and development opportunities in relation to emergency situations.     |                        |
| <b>Required readings</b> (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Dr. Sáfár Brigitta: a reziliencia szerepe veszélyhelyzetek során (jegyzet)<br>IFRC (2021) Roadmap to Community Resilience Vol 2. International Federation of Red Cross and Red Crescent Societies, Geneva, 2021. Elérés: <a href="https://preparecenter.org/wp-content/uploads/2023/05/FINAL-Road-Map-to-Community-Resilience-v2_En.pdf">https://preparecenter.org/wp-content/uploads/2023/05/FINAL-Road-Map-to-Community-Resilience-v2_En.pdf</a> |                        |
| Recommended readings (textbooks, study materials):                                                                                                                                                                                                                                                                                                                                                                                                 |                        |



Sáfár, Brigitta: The role of humanitarian assistance in resilience development – an innovative research area. In: Molnár, András (szerk.) First Conference on Effective Response. Budapest, Magyarország: Magyar Vöröskereszt (2020) 115 p. pp. 15-23., 9 p.  
Kállai, Krisztina; Sáfár, Brigitta: A reziliencia elméletek mint az egyén és a közösségek alapvető képességének vizsgálata a krízishelyzetek és természeti katasztrófák kapcsán. VÉDELEM TUDOMÁNY: KATASZTRÓFAVÉDELMI ONLINE TUDOMÁNYOS FOLYÓIRAT 9: 3 pp. 45-51., 7 p. (2024)

Date: 13. September, 2025.

Prepared by: Dr. Sáfár Brigitta PhD





## COURSE SYLLABUS

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| Course title:<br><b>Safety of the Design and Use of Machines and Work Tools</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>dr. habil Szabó Gyula</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>60% theory – 40% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Type of class: lecture / seminar / practice / <b><u>consultation</u></b><br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Interpretation of legislation and standards, case study analysis, risk assessment practice, project work.                                                                                                                                                                                                                                                                                                                                                    |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br><br>Additional (specific) methods of knowledge assessment:<br>Students are required to <b>prepare a report</b> on the safety requirements for the use of a machine or work tool, taking into account their own research field.                                                                                                                                                                                                                                                                                                                                                                                                     |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| <b>Course description:</b> <ul style="list-style-type: none"><li>• The aim of the course is to enable students to identify, interpret, and apply the relevant regulations and standards for the safe design and use of machines and work tools.</li><li>• The curriculum covers the directives on machine safety and the minimum safety and health requirements for work equipment, as well as the MSZ EN ISO 12100:2011 standard (Safety of machinery – General principles for design – Risk assessment and risk reduction).</li><li>• Students will become familiar with the structure of harmonized standards and will process type B and C standards related to their own research area.</li></ul> |                        |



- The course also includes an introduction to methods of risk assessment for machines and work tools, as well as practical application of these methods.

**Required readings (textbooks, study materials):**

Guide to the application of the Machinery Directive 2006/42/EC

Machinery Regulation (Regulation (EU) 2023/1230)

Hungarian Decree 16/2008 (VIII.30.) NFGM on the safety requirements and conformity certification of machinery

Hungarian Decree 10/2016 (IV.5.) NGM on the minimum safety and health requirements for the use of work equipment

Legal regulations and standards processed during the course

**Recommended readings (textbooks, study materials):**

Hungarian legislation: <http://nit.hu/>

EU legislation: <http://eur-lex.europa.eu/>

Hungarian Standards Institution: <http://mszt.hu/>

European Agency for Safety and Health at Work (EU-OSHA):  
[https://oshwiki.eu/wiki/Main\\_Page](https://oshwiki.eu/wiki/Main_Page)  
train4work.eu

Pascal, E., Zunjic, A., Ferreira, P., Michez, B., Szabó, Gy. (2022): Interconnections Between Ergonomics and EU Machinery Directive – A Standpoint of the Federation of European Ergonomics Societies (FEES). IETI Transactions on Engineering Research and Practice, 6(1), 1–14.

Budapest, 21 August, 2025

Prepared by: dr. habil Gyula Szabó



## COURSE SYLLABUS

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| Course title:<br><b>Simulation of Vehicle Dynamics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Credit value: <b>3</b> |
| Course responsible and lecturer:<br><b>Dr. Tamás Szakács</b> , associate professor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>50% theory - 50% practice</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| Type of class: lecture / <b><u>seminar</u></b> / practice / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Case presentations and case study analyses, project works                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |
| Additional (specific) methods of knowledge assessment: -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| <b>Course description:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| <ul style="list-style-type: none"><li>- The course introduces the fundamental principles of vehicle dynamics through simplified rigid-body models, covering topics such as weight distribution, static wheel loads, tire–road interaction, and the effects of geometry and load transfer. Building upon these basics, more advanced vehicle dynamic models are developed to analyze stability properties including understeer, oversteer, and rollover tendencies.</li><li>- The course also addresses steering geometry (Ackermann angles, camber, caster, and toe-in) and suspension characteristics. Emphasis is placed on deriving analytical relationships that support vehicle design and performance evaluation.</li><li>- In addition to theoretical modeling, students will gain hands-on experience with vehicle dynamics simulation. The course covers the setup of simulation models, execution of</li></ul> |                        |



parameter studies, and post-processing of results. Typical driving maneuvers such as cornering, braking, lane-change, and steady-state tests are introduced and simulated.

- By the end of the course, students will have acquired fundamental skills in modeling, simulating, and analyzing vehicle dynamics, providing a solid foundation for advanced studies in automotive engineering, chassis control, and active safety systems.

**Required readings (textbooks, study materials):**

Rajamani, R. – Vehicle Dynamics and Control (Springer, 2012) ISBN 978-1-4614-1432-2

Hans B. Pacejka – Tyre and Vehicle Dynamics ISBN 978-1-4614-1432-2

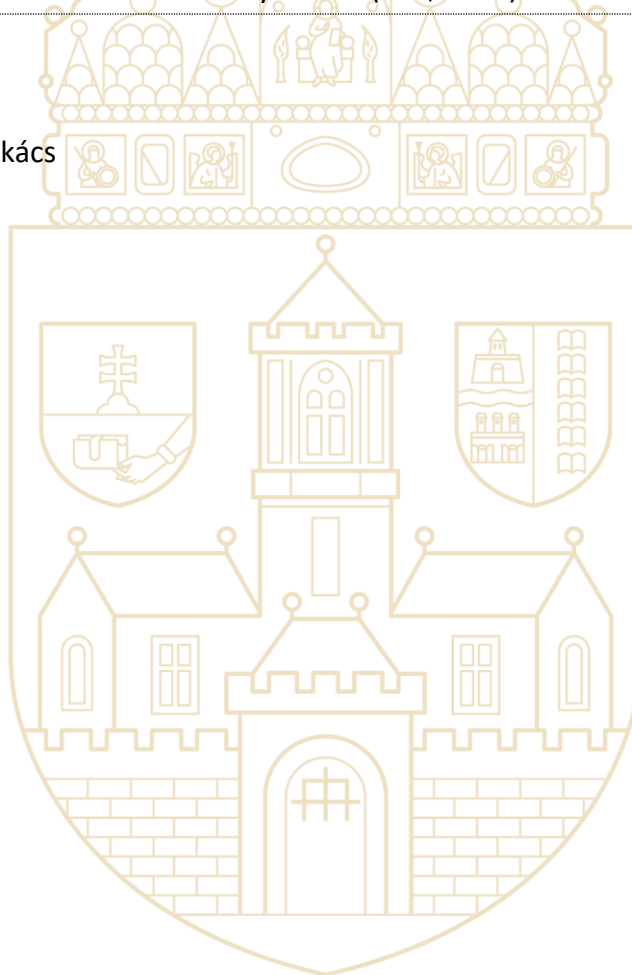
**Recommended readings (textbooks, study materials):**

<https://siva.banki.hu/~szakacs/segedanyagok/0910/JDEN/JDEN.html>

Gillespie, T. D. – Fundamentals of Vehicle Dynamics (SAE, 1992)

Date: 10.9.2025.

Prepared by: Dr. Tamás Szakács





## COURSE SYLLABUS

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Course title:<br><b>SPSS software application in statistics</b>                                                                                                                                                                                                                                                                                                                                                                                                                        | Credit value: <b>6</b> |
| Course responsible and lecturer:<br><b>Regina Zsuzsánna Reicher, Ph.D.</b>                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Course classification:<br>Basic course (subjects) in the field of safety and security science/ Research topic related basic course / <b><u>Optional subject</u></b>                                                                                                                                                                                                                                                                                                                    |                        |
| Proportion of theoretical and practical content, "Training character":<br><b>40% theory - 60% practice</b>                                                                                                                                                                                                                                                                                                                                                                             |                        |
| Type of class: lecture / seminar / <b><u>practice</u></b> / consultation<br>Total number of classes in the given semester: <b>30 classes</b><br>Methods and (specific) approaches, characteristics used to deliver the course content:<br>Within the framework of the course, data processing using Excel and SPSS software as part of a project.                                                                                                                                      |                        |
| Form of assessment: exam / <b><u>practical grade</u></b> / other<br><br>Additional (specific) methods of knowledge assessment:<br>Presentation of data processing and data interpretation in the form of a study. Preparation of a publishable study closely related to the candidate's topic. Full-length conference presentation in English or Hungarian, or publication in a scientific journal in English or Hungarian.                                                            |                        |
| Curricular placement of the course:<br>Can be taken in <b>semesters 1–4</b>                                                                                                                                                                                                                                                                                                                                                                                                            |                        |
| Prerequisites: None                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                        |
| <b>Course description:</b><br><br>- Doctoral candidates learn the methods of processing and analysing data collected during research. They will learn how to apply the procedures studied in theory using SPSS software. The aim is to enable them to solve research problems using univariate and multivariate methods. The course also aims to familiarise candidates with the methods needed to study and analyse the quantifiable implications of economic and business phenomena. |                        |



- During the course, PhD students will be introduced to the possibilities of SPSS software in quantitative research. They will explore the possibilities of descriptive statistical calculations and gain insight into the various methods of correlation analysis. They will learn about parametric and non-parametric procedures. Where possible, they will also carry out multivariate analyses (regression analysis, factor analysis, cluster analysis) if the type of research and the purpose of the thesis requires it.

**Required readings** (textbooks, study materials):

Brian C. Cronk (2019) How to Use SPSS®: A Step-By-Step Guide to Analysis and Interpretation 11th Edition

David Robinson (2024) SPSS Made Easy: A Practical Guide to Statistical Analysis for Students and Researchers (ebook)

Andy Field (2024) Discovering Statistics Using IBM SPSS Statistics Sixth Edition

Sabine Landau (2003) A Handbook of Statistical Analyses Using SPSS

[https://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS\\_Statistical\\_Analyses\\_using\\_SPSS.pdf](https://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS_Statistical_Analyses_using_SPSS.pdf)

**Recommended readings** (textbooks, study materials):

James O. Aldrich (2019) Using IBM® SPSS® Statistics: An Interactive Hands-On Approach SAGE Publications, Inc

Julie Pallant (2020) SPSS Survival Manual A step by step guide to data analysis using IBM SPSS (ebook)

William E. Wagner, III (2019) Using IBM® SPSS® Statistics for Research Methods and Social Science Statistics, California State University, Dominguez Hills, USA

Date: 15. September 2025

Prepared by: Regina Zsuzsánna Reicher, PhD.