

Dr Mutaz Ryalat

Curriculum Vitæ

Department of Mechatronics Engineering
School of Applied technical sciences
German Jordanian University
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Professional Appointments

- 2025–Present **Director**, *Robotics and Autonomous Systems Hub*, Technology, Research, and Innovation Complex (TRIP). GJU
- Summer 2024 **Academic Research Visit**, *The Hamlyn Centre for Surgical Robotics*, Imperial College London. London, UK
- 2026–Present **Professor**, *Mechatronics Engineering Department*, German Jordanian University. Amman, Jordan
- 2020 – 2026 **Associate Professor**, *Mechatronics Engineering Department*, German Jordanian University. Amman, Jordan
- 2020 – 2021 **Vice Dean**, *School of Applied Technical Sciences*, German Jordanian University. Amman, Jordan
Major achievements:
- Improving German year procedures and collaboration with German partners
 - Establishing and developing the Digital Learning Strategy within the school and university
 - Coordinating and supervising the implementation of the German accreditation system within the school
 - Improving the study plans of the departments within the school
 - Facilitating students' issues in general
- 2017 – 2020 **Head of Mechatronics Engineering Department**, *School of Applied Technical Sciences*, German Jordanian University. Amman, Jordan
Major achievements:
- Developed the curriculum for a new Bachelor's degree by introducing artificial intelligence, industry 4.0 and the internet of things to the Mechatronics Engineering programme.
 - Established and developed educational labs in the areas of sensors and actuators, instrumentation and measurements, control, robotics and Mechatronics system design.
 - Recruited new faculty and teaching assistants to meet the needs of the department.
 - Established a Twin bachelor's degree (Robotics programme) with the University of Applied Sciences Würzburg-Schweinfurt
- 2015 – 2020 **Assistant Professor**, *Mechatronics Engineering Department*, German Jordanian University. Amman, Jordan
- 2012 – 2015 **Graduate Teaching Assistant**, *Faculty of Engineering*, University of Southampton. Southampton, UK
Responsible for teaching theoretical aspects of lab experiments and supervising students when performing experiments during lab sessions and grading assignments.

- 2010 – 2011 **Teaching Assistant**, *Mechatronics Engineering Department*, German Jordanian University. Amman, Jordan
Responsible for teaching theoretical aspects of lab experiments and supervising students when performing experiments during lab sessions and grading assignments.
- 2008 – 2010 **Assistant Underwriter**, *International General Insurance*, Amman, Jordan
Assistant Underwriter, Construction and Engineering

Education

- 2015 **PhD Control Engineering**, *University of Southampton*, UK.
Thesis: Design and Implementation of Nonlinear and Robust Control for Hamiltonian Systems: The Passivity-Based Control Approach.
Supervisor: Prof. Dina Shona Laila.
- 2007 **MSc Mechatronics Engineering**, *Loughborough University*, UK.
Thesis: Control of a Rotary Table for the SPIDER: A Synchro-Drive Grass Mower Mobile robot.: Prof. Robert Parkin.
- 2005 **BSc Mechatronics Engineering**, *The University of Jordan*, Jordan.

Awards and Honors

- 2025 The Robot Operating System ROS 2 Training certificate
- 2025 Artificial Intelligence Olympiad (AIO), 3rd place in both Embedded Systems and Computer Vision
- 2024 Summer research fellowship (Academic Research Visit, The Hamlyn Centre for Surgical Robotics, Imperial College London. London, UK
- 2024 Artificial Intelligence Olympiad (AIO), 3rd place in both Embedded Systems and Computer Vision
- 2024 Internet of things and Artificial Intelligence Challenge (2nd place)
- 2023 JODDB Creative Excellence Initiative, "AI- based Failure Detection/Prediction of 3D Printers"
- 2023 Academic Practice License, The Ministry of Higher Education and Scientific Research
- 2020 IBM Digital Badge, "IoT Cloud Developer - Explorer Award 2020"
- 2018 First Prize in the 19th Arab Forum for Entrepreneurship (awarded by ACTSAU & AGYA for the best project in the track of information systems)
- 2011 Full Ph.D. Scholarship at the University of Southampton, UK (*awarded by GJU*)

Research Activities

My research interests lie in the areas of Mechatronics and its application in Control, Robotics, and Autonomous Systems.

Research Interest

- Linear and Nonlinear Control with Applications.
- Robotics: Industrial, Mobile, and Collaborative Robots.
- Automation, Smart Manufacturing and Industry 4.0.
- AI.

Funding

- \$ 100,000 : Autonomous Vehicles Research Studio, DSR-GJU
- 1 Million Euro: Robotics Twin project, THWS, DAAD
- \$ 110,000: Smart Factories and the Green Transition – Aspects of Connectivity and Network Cybersecurity, Matching Grant GJU-JUST-HTU
- \$ 40,000: Smart Center-pivot Greenhouse for Automated Crop Cultivation and Monitoring, DSR-GJU
- \$ 400,000: Industry 4.0 (Smart cyber-physical factory), GJU
- \$ 15,000: Real-Time Failure Detection/Prediction in 3D Printing Using AI, JODDB
- \$ 20,000: Automated Intelligent Robotic system for hArveSt goodS, Hochschule Trier, DAAD

Skills

- Languages & Packages **PLC, C++, MATLAB®, SIMULINK®, MAPLE®, ROS, GAZEBO.**
- Office and Type Setting **TEX(L^AT_EX, BibTEX), Microsoft Office.**
- Apps
- OS **Windows.**
- e-learning: **Microsoft Teams, Moodle**

Teaching Experience

German Jordanian University – Jordan

2015–Present **Lecturer, Lab Instructor, and Modules Coordinator**

- Robotics
- Automation & Industry 4.0
- Control Systems I
- Control Systems II
- Statics and Dynamics
- Dynamics and Vibration
- Instrumentation and Measurements
- Sensors and Actuators
- State-Space Control and Observers
- Mechatronics System Design & Interfacing
- Engineering Economics
- Vibration and Control Lab
- Sensors and Actuators Lab
- Automatic Control Systems Lab
- Instrumentation and Measurements Lab
- Mechatronics System Design & Integration Lab

University of Southampton - Southampton, UK

2012–2015 **Teaching Assistant**

- Automatic Control Systems
- Automatic Control Systems lab
- Electronics Lab

Professional Memberships

Membership

2013–present

- Senior Member, IEEE
- Chairman, IEEE- RAS Jordan Chapter
- IEEE Societies, IES, RAS, Wie, IEEE Nano, IEEE TEC, IAS, CSS, ITSS, IoT, ComSoc, AESS and EMBS.
- IEEE Student Branch: Advisor for German Jordanian University.

2006–present Member, Jordan Engineers Association

Pro-bono Assignment

2015–present Reviewer

- Automatica
- IEEE Transactions on Automatic control
- IEEE Transactions on Industrial Electronics
- IEEE/ASME Transactions on Mechatronics
- IEEE Robotics and Automation Letters
- Mechatronics
- Journal of Field Robotics
- IEEE Access
- IEEE Internet of Things Journal
- IEEE Transactions on Systems, Man and Cybernetics: Systems
- Expert Systems With Applications
- European Journal of Control
- International Journal of Robust and Nonlinear Control
- Journal of Systems and Control Engineering
- Journal of Intelligent & Robotic Systems
- Journal of the Franklin Institute
- International Journal of Adaptive Control and Signal Processing
- Annual American Control Conference (ACC)
- IEEE Conference on Decision and Control (CDC)

Conference Organizing

- 2025 ICRA 2025, Organizer and host of Satellite Conference Center
- 2025 The 13th International Conference on Control, Mechatronics and Automation (ICCMA 2025), Member of the Scientific Committee, Paris, France – November 24-26, 2025.
- 2025 2025 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT), Member of the Scientific Committee, Amman, Jordan – 2025.
- 2025 The 11th International Conference on Automation, Robotics, and Applications (ICARA 2025), Speaker and Member of the Scientific Committee, Zagreb, Croatia – February 12-14, 2025.
- 2024 The 12th International Conference on Control, Mechatronics and Automation (ICCMA 2024), Member of the Scientific Committee, London, UK – November 11-13, 2024.
- 2024 International Conference on Research and Education in Mechatronics (REM), Co-chair, Amman, Jordan – 2024.

- 2023 The 11th International Conference on Control, Mechatronics and Automation (ICCMA 2023), Member of the Scientific Committee, University of Agder, Norway, – November 1-3, 2023.
- 2023 2023 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT), Member of the Scientific Committee, Amman, Jordan – 2023.
- 2021 2021 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT), Member of the Scientific Committee, Amman, Jordan – 2021.

Languages

Arabic **Native**
 English **Fluent**

PUBLICATIONS

○ A. Peer-Reviewed Journals:

1. **M. Ryalat**, "Smart Additive Manufacturing: An IoT-Driven Framework for Predictive Failure Detection and Sustainable Operation," *Additive Manufacturing Frontiers*, *Accepted*, **2025**.
2. **M. Ryalat**, G. Al-Refai, N. Almtireen, and H. Elmoaqet, "Design of a ROS2-Based Hybrid Aerial-Ground Robot for Autonomous Inspection Applications," *IEEE Access*, vol. 13, pp. 109274–109293, **2025**.
3. **M. Ryalat**, N. Almtireen, G. Al-Refai, H. Elmoaqet, and N. Rawashdeh, "Research and Education in Robotics: A Comprehensive Review, Trends, Challenges, and Future Directions," *Journal of Sensor and Actuator Networks*, vol. 14, pp. 14, **2025**.
4. N. Almtireen, A. Abuhejleh, **M. Ryalat**, H. Elmoaqet, and G. Al-Refai, "Deep transfer learning for sustainable waste management: Real-time waste segregation apparatus using a two-phase CNN framework," *The Journal of Supercomputing*, vol. 81, pp. 1411, **2025**.
5. H. Elmoaqet, H. Qaddoura, **M. Ryalat**, N. Almtireen, T. A. Alshirbaji, N. A. Jalal, T. Neumuth, and K. Moeller, "Deep Learning Architectures for Single-Label and Multi-Label Surgical Tool Classification in Minimally Invasive Surgeries," *Applied Sciences*, vol. 15, no. 11, Art. no. 6121, **2025**.
6. H. Elmoaqet, R. Janini, **M. Ryalat**, G. Al-Refai, T. A. Alshirbaji, N. A. Jalal, T. Neumuth, and N. Navab, "Using Masked Image Modelling Transformer Architecture for Laparoscopic Surgical Tool Classification and Localization," *Sensors*, vol. 25, no. 10, Art. no. 3017, **2025**.
7. G. Al-Refai, D. Karasneh, H. Elmoaqet, **M. Ryalat**, and N. Almtireen, "Surface Classification from Robot Internal Measurement Unit Time-Series Data Using Cascaded and Parallel Deep Learning Fusion Models," *Machines*, vol. 13, no. 3, Art. no. 251, **2025**.
8. E. Franco and **M. Ryalat**, "Position-Feedback Integral IDA-PBC for Constant Matched and Unmatched Disturbances," *International Journal of Robust and Nonlinear Control*, vol. 35, no. 9, pp. 3623–3639, **2025**.
9. N. Almtireen, V. Reddy, M. Sutton, A. Nedvidek, C. Karn, **M. Ryalat**, H. Elmoaqet, and N. Rawashdeh, "PLC-Controlled Intelligent Conveyor System with AI-Enhanced Vision for Efficient Waste Sorting," *Applied Sciences*, vol. 15, no. 3, Art. no. 1550, **2025**.
10. **M. Ryalat**, E. Franco, H. Elmoaqet, N. Almtireen, and G. Al-Refai, "The Integration of Advanced Mechatronic Systems into Industry 4.0 for Smart Manufacturing," *Sustainability*, vol. 16, no. 19, Art. no. 8504, **2024**.
11. H. Elmoaqet, M. Eid, **M. Ryalat**, and T. Penzel, "A CNN-BiLSTM Deep Learning Model for

Automatic Scoring of EEG Signals," *Current Directions in Biomedical Engineering*, vol. 9, no. 1, pp. 642–645, **2023**.

12. **M. Ryalat**, H. Elmoaqet, and M. Al-Faouri, "Design of a Smart Factory Based on Cyber-Physical Systems and Internet of Things towards Industry 4.0," *Applied Sciences*, vol. 13, no. 4, Art. no. 2156, **2023**.
13. H. Elmoaqet, M. Eid, **M. Ryalat**, and T. Penzel, "A Deep Transfer Learning Framework for Sleep Stage Classification with Single-Channel EEG Signals," *Sensors*, vol. 22, no. 22, Art. no. 8826, **2022**.
14. G. Al-Refai, H. Elmoaqet, and **M. Ryalat**, "In-Vehicle Data for Predicting Road Conditions and Driving Style Using Machine Learning," *Applied Sciences*, vol. 12, no. 18, Art. no. 8928, **2022**.
15. H. Elmoaqet, M. Eid, **M. Ryalat**, and T. Penzel, "An End-to-End Deep Learning Approach for Sleep-Wake Classification Using Single-Channel EEG Signals," *Current Directions in Biomedical Engineering*, vol. 8, no. 2, pp. 801–804, **2022**.
16. **M. Ryalat**, D. S. Laila, and H. Elmoaqet, "Adaptive Interconnection and Damping Assignment Passivity Based Control for Underactuated Mechanical Systems," *Int. J. of Control, Automation and Systems*, vol. 19, no. X, pp. 1–14, **2021**.
17. **M. Ryalat**, D. S. Laila, H. Elmoaqet, and N. Almtireen, "Dynamic IDA-PBC Control for Weakly-Coupled Electromechanical Systems," *Automatica*, vol. 115, Art. no. 108880, **2020**.
18. **M. Ryalat**, H. S. Damiri, and H. Elmoaqet, "Particle Swarm Optimization of a Passivity-Based Controller for Dynamic Positioning of Ships," *Applied Sciences*, vol. 10, no. 20, Art. no. 7314, **2020**.
19. **M. Ryalat**, H. S. Damiri, H. Elmoaqet, and I. AlRabadi, "An Improved Passivity-Based Control of Electrostatic MEMS Device," *Micromachines*, vol. 11, no. 7, Art. no. 688, **2020**.
20. H. Elmoaqet, M. Eid, M. Glos, **M. Ryalat**, and T. Penzel, "Deep Recurrent Neural Networks for Automatic Detection of Sleep Apnea from Single Channel Respiration Signals," *Sensors*, vol. 20, no. 18, Art. no. 5037, **2020**.
21. H. Elmoaqet, J. Kim, D. Tilbury, S. K. Ramachandran, **M. Ryalat**, and C.-H. Chu, "Gaussian Mixture Models for Detecting Sleep Apnea Events Using Single Oronasal Airflow Record," *Applied Sciences*, vol. 10, no. 21, Art. no. 7889, **2020**.
22. N. Almtireen, H. Elmoaqet, and **M. Ryalat**, "Linearized Modelling and Control for a Twin Rotor System," *Automatic Control and Computer Sciences*, vol. 52, no. 6, pp. 539–551, **2018**.
23. **M. Ryalat** and D. S. Laila, "A Robust IDA-PBC Approach for Handling Uncertainties in Underactuated Mechanical Systems," *IEEE Transactions on Automatic Control*, vol. 63, no. 10, pp. 3495–3502, **2018**.
24. **M. Ryalat** and D. S. Laila, "A Simplified IDA-PBC Design for Underactuated Mechanical Systems with Applications," *European Journal of Control*, vol. 27, pp. 1–16, **2016**.

○ B. Book Chapters

1. **M. Ryalat**, M. Al-Faouri, H. Elmoaqet, N. Almtireen, and G. Al-Refai, "The Integration of Ecomechatronics and Industry 4.0 Towards Sustainable Manufacturing," in *Mechatronic Futures*, P. Hehenberger and D. Bradley, Eds., Springer Cham, Switzerland: **2025**, pp. 347–362.

○ C. Peer-Reviewed Conferences

1. **M. Ryalat**, "Empowering Engineering Education with the Robot Operating System (ROS): An Open Source Platform," *The 51st Annual Conference of the IEEE Industrial Electronics Society (IECON 2025)*, Madrid-Spain, Oct. **2025**.
2. **M. Ryalat**, M. Ahasan, H. Elmoaqet, and N. Almtireen, "Mechatronics Design and Simulation of a novel Hybrid Ground/Aerial robot for Infrastructure Inspection," in *Proc. 11th Int. Conf. on Automation, Robotics, and Applications (ICARA)*, Zagreb, Croatia, Feb. **2025**, pp. 170–177.

3. G. Al-refai, M. Al-refai, H. Elmoaqet, **M. Ryalat** and N. Almtireen, "Performance Evaluation of YOLOv7 for Object Detection in Dark Environments," in *Proc. 22nd Int. Conf. on Electro-Information Technology*, Indiana-USA, May **2025**, pp. 36–41.
4. N. Almtireen, Z. Ateh, M. Eltallaa, Y. Alhendawy, **M. Ryalat**, and H. Elmoaqet, "Real time infrared distance sensor for cyber physical systems using Arduino-LabVIEW integration," in *Proc. 22nd Int. Conf. on Communication, Computing, Networking, and Control in Cyber-Physical Systems*, Dubai, UAE, June. **2025**, pp. 31-36.
5. **M. Ryalat**, N. A. Rawashdeh, N. A. Alrub, and H. Elmoaqet, "Mechatronics Design and Control of a Hybrid Flying-Ground Robot for Long-Endurance Mobility," in *Proc. 12th Int. Conf. on Control, Mechatronics and Automation (ICCMA)*, London, UK, Nov. **2024**, pp. 336–342.
6. A. A. Abuhejleh, M. Z. Alafeshat, N. Almtireen, H. Elmoaqet, **M. Ryalat**, and M. M. AlAjlouni, "Recyclable Waste Categorization with Transfer Learning," in *Proc. 22nd Int. Conf. on Research and Education in Mechatronics (REM)*, Amman, Jordan, Sept. **2024**, pp. 343–348.
7. N. Almtireen, H. Altaha, A. Alissa, **M. Ryalat**, and H. Elmoaqet, "AI-Driven Mobile App for Personalized Health Monitoring," in *Proc. 22nd Int. Conf. on Research and Education in Mechatronics (REM)*, Amman, Jordan, Sept. **2024**, pp. 338–342.
8. M. Ishaqat, J. Müller, **M. Ryalat**, and I. Ramsteiner, "3D Printed Smart Designs - A Cost-Effective and Fast Alternative to Conventional Manufacturing Methods," in *Proc. 22nd Int. Conf. on Research and Education in Mechatronics (REM)*, Amman, Jordan, Sept. **2024**, pp. 204–209.
9. E. Franco and **M. Ryalat**, "IDA-PBC with Dynamic Extension for Momenta Observation of Underactuated Mechanical Systems," in *Proc. IEEE Conf. on Control Technology and Applications (CCTA)*, Newcastle upon Tyne, UK, Aug. **2024**, pp. 126–131.
10. **M. Ryalat**, N. Almtireen, H. Elmoaqet, and M. Almohammed, "The Integration of Two Smarts in the Era of Industry 4.0: Smart Factory and Smart City," in *Proc. IEEE Smart Cities Futures Summit (SCFC)*, Marrakech, Morocco, May **2024**, pp. 9–12.
11. **M. Ryalat**, H. Alawamleh, H. Elmoaqet, and N. Almtireen, "Mechatronics Design and Implementation of a Smart Plastic Injection Moulding Machine," in *Proc. 11th Int. Conf. on Control, Mechatronics and Automation (ICCMA)*, Grimstad, Norway, Nov. **2023**, pp. 352–357.
12. H. Elmoaqet, M. Eid, **M. Ryalat**, N. Almtireen, G. Al-Refai, and T. Penzel, "Automatic Sleep Staging for EEG Signals Using GoogLeNet Deep Architecture and Continuous Wavelet Transform," in *Proc. 7th Int. Conf. on Advances in Biomedical Engineering (ICABME)*, Beirut, Lebanon, Oct. **2023**, pp. 115–120.
13. G. Al-Refai, M. Al-Refai, H. Elmoaqet, **M. Ryalat**, and N. Almtireen, "Performance Evaluation of YOLOv7 for Object Detection in Dark Environments," in *Proc. IEEE Int. Conf. on Electro/Information Technology (EIT)*, Indiana, USA, **2025**, accepted for publication.
14. N. Almtireen, Z. Ateh, M. Eltallaa, Y. Alhendawy, **M. Ryalat**, and H. Elmoaqet, "Real time infrared distance sensor for cyber physical systems using Arduino-LabVIEW integration," in *Proc. Int. Conf. on Communication, Computing, Networking, and Control in Cyber-Physical Systems (CCNCPS)*, Dubai, UAE, **2025**, accepted for publication.
15. **M. Ryalat**, M. Alshergatli, and H. Elmoaqet, "IoT-aided Smart Lawnmower," in *Proc. 3rd Int. Symp. on Computer Science and Intelligent Control (ISCSIC)*, Amsterdam, Netherlands, Art. no. 65, pp. 1–8, **2019**.
16. H. Elmoaqet, I. Ismael, F. Patzolt, and **M. Ryalat**, "Design and Integration of an IoT Device for Training Purposes of Industry 4.0," in *Proc. 2nd Int. Symp. on Computer Science and Intelligent Control (ISCSIC)*, Stockholm, Sweden, Art. no. 25, pp. 1–5, **2018**.
17. **M. Ryalat**, D. S. Laila, N. Almtireen, and H. Elmoaqet, "A Novel Dynamic IDA-PBC Controller for Electrostatic MEMS Devices," in *Proc. 2018 American Control Conference (ACC)*, Milwaukee, WI, USA, pp. 2952–2957, **2018**.
18. H. Elmoaqet, Z. Almuwaqat, **M. Ryalat**, and N. Almtireen, "A New Algorithm for Short-Term

- Prediction of Persistent Atrial Fibrillation," in *Proc. 2017 IEEE Jordan Conf. on Applied Electrical Engineering and Computing Technologies (AEECT)*, Aqaba, Jordan, pp. 1–6, **2017**.
19. **M. Ryalat**, D. S. Laila, and M. M. Torbati, "Integral IDA-PBC and PID-like Control for Port-Controlled Hamiltonian Systems," in *Proc. 2015 American Control Conference (ACC)*, Chicago, IL, USA, pp. 5365–5370, **2015**.
 20. **M. Ryalat** and D. S. Laila, "IDA-PBC for a Class of Underactuated Mechanical Systems with Application to a Rotary Inverted Pendulum," in *Proc. 52nd IEEE Conf. on Decision and Control (CDC)*, Florence, Italy, pp. 5240–5245, **2013**.