Zeki O. Ilhan, PhD

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EDUCATION

Lehigh University, Bethlehem, PA

Ph.D. in Mechanical Engineering – Control Systems ***Sep 2016***

Advisor: Dr. Eugenio Schuster

Dissertation:

Model-based Optimization and Feedback Control of the Current Density Profile Evolution in NSTX-U

Middle East Technical University (METU), Ankara, Turkey

B.S. in Mechanical Engineering ***Jun 2010***

ACEDEMIC EXPERIENCE

Midwestern State University, Wichita Falls, TX

Associate Professor	*Aug 2023 – Present*
Assistant Professor	*Aug 2018 – Aug 2023*
Visiting Assistant Professor	*Aug 2017 – Aug 2018*

US Coast Guard Academy, New London, CT

Mechanical Engineering Lecturer	*Jan 2017 – Jun 2017*

Princeton Plasma Physics Laboratory, Princeton, NJ

Visiting Researcher	*Jun 2015 – Aug 2015*

TEACHING EXPERIENCE

Midwestern State University, Wichita Falls, TX

MENG 1101 - Introduction to Engineering	*Mean Instructor Rating* = 4.56 / 5.00
MENG 1132 - Engineering Graphics	4.53 / 5.00
MENG 1202 - Solid Modeling	4.66 / 5.00
MENG 2113 - Statics	4.50 / 5.00
MENG 2223 - Mechanics of Solids	4.71 / 5.00
MENG 4143 - Senior Design Laboratory I	4.30 / 5.00
MENG 4243 - Senior Design Laboratory II	3.82 / 5.00
MENG 4203 - Mechanical Engineering Analysis	4.58 / 5.00
MENG 4253 - Control Systems	4.61 / 5.00
MENG 2212 - Engineering Computation	4.75 / 5.00
MENG 4122 - Machine Control Programming Laboratory	**new, in-progress*

TEACHING EXPERIENCE (CONT'D)

US Coast Guard Academy, New London, CT — *Jan 2017 – Jun 2017*

Modeling and Control of Dynamic Systems

Engineering Materials Science Laboratory

Lehigh University, Bethlehem, PA — *Jan 2013 – Jun 2013*

Mechanical Vibrations (Recitation Leader)

Mechanical Engineering Laboratory I (Teaching Assistant)

RELEVANT SKILLS

- **PLC Programming:** RSLogix 500
- **PLC HMI Development:** Panel View 550
- **PLC Hardware:** Allen Bradley SLC 5/05, Amatrol
- **Computing/Simulation:** MATLAB, SIMULINK
- **IDE Programming:** ARDUINO
- **Computer-Aided Design:** SolidWorks
- **3D-Printing/Slicing:** UltiMaker Cura, Slic3r
- **Typesetting:** LaTeX

JOURNAL PUBLICATIONS

1. W. Guttenfelder, **(Z. Ilhan)** et al. (Collaboration Paper), "NSTX-U theory, modeling and analysis results" *Nuclear Fusion* 62 (2022) 042023 (17 pp).
   https://iopscience.iop.org/article/10.1088/1741-4326/ac5448

2. **Z. Ilhan**, Mark D. Boyer, and E. Schuster, "TRANSP-based closed-loop simulations of current profile optimal regulation in NSTX-Upgrade''
   Fusion Engineering and Design, vol. 146, part A, pp. 555-558, February 2019.
   https://doi.org/10.1016/j.fusengdes.2019.01.021

3. **Z. Ilhan**, J.E. Barton, E. Schuster, D.A. Gates, S.P. Gerhardt, and J.E., Menard, ''Physics-based control-oriented modeling of the current density profile evolution in NSTX-Upgrade''
   Fusion Engineering and Design, vol. 123, pp. 564-568, November 2017.
   https://doi.org/10.1016/j.fusengdes.2017.04.028

4. **Z. Ilhan**, Q. Wang, J. Barry, D. Huxley-Cohen, H. Wang, E. Schuster et al, ''Extremum-seeking-based fluctuation mitigation and azimuthal velocity profile regulation by $E \times B$ Actuation in HELCAT''
   IEEE Transactions on Plasma Science, vol. 42, no. 3, pp. 458-468, March 2014.
   https://ieeexplore.ieee.org/document/6737330

5. **Z. Ilhan**, D. Huxley-Cohen, H. Wang, E. Schuster, M Gilmore, and A. Ware, ''Optimal control of the plasma azimuthal velocity profile by feedback ExB actuation in HELCAT''
   IEEE Transactions on Plasma Science, vol. 42, no. 3, pp. 469-476, March 2014.
   https://ieeexplore.ieee.org/document/6750102

PEER-REVIEWED CONFERENCE PROCEEDINGS

1. **Z. Ilhan,** "Benchmarking Various Nonlinear Control Design Techniques for a Two-Link Planar Robot Arm." *Proceedings of the ASME 2022 International Mechanical Engineering Congress and Exposition (IMECE) Volume 7: Engineering Education*. Columbus, Ohio, USA. October 30–November 3, 2022. V007T09A004. ASME.
   https://doi.org/10.1115/IMECE2022-95524

2. **Z. Ilhan,** & M. Chew, "Nonlinear Robust Control Design for a Gravity Compensation Mechanism under Human Walking Pattern Scenarios." *Proceedings of the ASME 2021 International Mechanical Engineering Congress and Exposition*. *Volume 7A: Dynamics, Vibration, and Control.* Virtual, Online. November 1–5, 2021. V07AT07A026. ASME.
   https://doi.org/10.1115/IMECE2021-71712

3. **Z. Ilhan**, "Design of Model-Based Linear and Nonlinear Controllers to Stabilize a Simple Experimental Setup for Controls Education." *Proceedings of the ASME 2021 International Mechanical Engineering Congress and Exposition*. *Volume 9: Engineering Education.* Virtual, Online. November 1–5, 2021. V009T09A004. ASME
   https://doi.org/10.1115/IMECE2021-71863

4. **Z. Ilhan,** & M. Chew, "Nonlinear Control Design for a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation." *Proceedings of the ASME 2020 International Mechanical Engineering Congress and Exposition*. *Volume 7A: Dynamics, Vibration, and Control*. Virtual, Online. November 16–19, 2020. V07AT07A020. ASME.
   https://doi.org/10.1115/IMECE2020-24148

5. **Z. Ilhan,** J.T. Ok, B. Eakins, C. Masters, K. Thompson, and T. Vital, "Design and Implementation of a Pulley-Based Movable LED System for Optimal Plant Growth." *Proceedings of the ASME 2020 International Mechanical Engineering Congress and Exposition*. *Volume 5: Biomedical and Biotechnology*. Virtual, Online. November 16–19, 2020.
   V005T05A020. ASME.
   https://doi.org/10.1115/IMECE2020-24089

6. **Z. Ilhan,** W. Loveland, and J. Baker, "Design of a Simple Experimental Setup for Proportional-Integral-Derivative (PID) Control Testing." *Proceedings of the ASME 2020 International Mechanical Engineering Congress and Exposition*. *Volume 9: Engineering Education*. Virtual, Online. November 16–19, 2020.
   V009T09A007. ASME.
   https://doi.org/10.1115/IMECE2020-24204

7. **Z. Ilhan**, W.P. Wehner, and E. Schuster, ''Model Predictive Control with Integral Action for the Rotational Transform Profile Tracking in NSTX-U''
   Proceedings of the IEEE Conference on Control Applications, (Buenos Aires, Argentina), 2016, pp. 623-628.
   https://ieeexplore.ieee.org/document/7587899

8. **Z. Ilhan**, W. Wehner, J. Barton, E. Schuster et al, ''First-Principles-Driven Model-Based Optimal Control of the Current Profile in NSTX-U''
   Proceedings of the IEEE Conference on Control Applications, (Sydney, Australia), 2015, pp. 1303-1308.
   https://ieeexplore.ieee.org/document/7320792

CONFERENCE PROCEEDINGS

1. **Z. Ilhan,** D. Huxley-Cohen, H. Wang, E. Schuster *et al*, ''Optimal Closed-Loop Control of the Azimuthal Velocity Profile by E×B Actuation in HELCAT'', *IEEE 25th Symposium on Fusion Engineering (SOFE),* San Francisco, California, USA, June 10-14, 2013.
   https://ieeexplore.ieee.org/document/6635480

2. **Z. Ilhan** J. Barry, H. Wang, E. Schuster, M. Gilmore, and A. Ware, ''Fluctuation Mitigation and Azimuthal Velocity Profile Regulation by Extremum Seeking in HELCAT'', *IEEE 25th Symposium on Fusion Engineering (SOFE),* San Francisco, California, USA, June 10-14, 2013.
   https://ieeexplore.ieee.org/document/6635479

CONFERENCE ABSTRACTS & POSTER PRESENTATIONS

1. **Z. Ilhan**, S. Lee, P. Nguyen, and M. White, "Mechanism-Control Design Integration for a Gravity Compensation System for Human Lower Limb Rehabilitation", *2022 Oklahoma State University (OSU) International Mechatronics Conference and Workshops*. September 27 - 29, 2023

2. **Z. Ilhan**, N. Inge, G. Junkere, T. Green, and C. Simeon, "Design and Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", *2021 Oklahoma State University (OSU) International Mechatronics Conference and Workshops,* Virtual, Online. September 27 - October 1, 2021

3. R. Stuart, J. Gillis, T. Hardee, C. Park, C. Palmore, **Z. Ilhan**, B. Schaffner, and J. Arbuckle, "Design of a Rotating Assembly Fixture for Power Take-Off Units", *2020 ASME International Mechanical Engineering Congress and Exposition (IMECE)*, IMECE2020-24089, Virtual, Online. November 16-19, 2020.

4. **Z. Ilhan**, W. Loveland, and J. Baker, "Design of a Simple Experimental Setup for Linear and Nonlinear Control Testing", *2020 Oklahoma State University (OSU) International Virtual Mechatronics Conference and Workshops,* Virtual, Online. October 20-22, 2020

5. C. LaRonde and **Z. Ilhan,** "Adaptive Control Design for a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", *Capital of Texas Undergraduate Research Conference,* University of Texas at Austin, Austin, TX, November 16, 2019

6. J. Cognasi, J. Perkins, J. Randall, M. Ronoh, J.T. Ok, and **Z. Ilhan**, "A Pulley Based Movable LED System for Plant Growth", *2019 ASME International Mechanical Engineering Congress and Exposition (IMECE)*, IMECE 2019- 11602, Salt Lake City, UT, November 11-14, 2019.

7. **Z. Ilhan,** E. Schuster, M.D. Boyer, "TRANSP-based Closed-loop Simulations of Current Profile Optimal Regulation in NSTX-Upgrade", *30th Symposium on Fusion Technology (SOFT)*, Giardini Naxos, Sicily, Italy, September 16-21, 2018.

8. **Z. Ilhan,** W.P. Wehner, E. Schuster and D. Boyer, "Model Predictive Control with Integral Action for Current Density Profile Tracking in NSTX-U", *58th Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS)*, San Jose, California, USA, October 31-November 4, 2016.

9. **Z. Ilhan**, J.E. Barton, E. Schuster et al, "Physics-based Control-oriented Modeling of the Current Density Profile Evolution in NSTX-Upgrade", *29th Symposium on Fusion Technology (SOFT),* Prague, Czech Republic, September 5-9 2016.

10. **Z. Ilhan,** W.P. Wehner, E. Schuster, M.D. Boyer, D.A. Gates et al, "Performance Assessment of Model-Based Optimal Feedforward and Feedback Current Profile Control in NSTX-U Using the TRANSP Code", *57th Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS)*, Savannah, Georgia, USA, November 16-20, 2015.

CONFERENCE ABSTRACTS & POSTER PRESENTATIONS (CONT'D)

11. **Z. Ilhan**, J. Barton, W. Wehner et al, "First-Principles-Driven Model-Based Optimal Control of the Current Profile in NSTX-U", *56th Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS)*, New Orleans, Louisiana, USA, October 27-31, 2014.
12. **Z. Ilhan,** J. Barton, W. Shi et al, "Physics-Based Control-Oriented Modeling of the Current Profile Evolution in NSTX-Upgrade", *55th Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS),* Denver, Colorado, USA, November 11-15, 2013.
13. **Z. Ilhan,** D. Huxley-Cohen, H. Wang, E. Schuster *et al*, ''Optimal Closed-Loop Control of the Azimuthal Velocity Profile by E×B Actuation in HELCAT'', *IEEE 25th Symposium on Fusion Engineering (SOFE),* San Francisco, California, USA, June 10-14, 2013.
14. **Z. Ilhan** J. Barry, H. Wang, E. Schuster, M. Gilmore, and A. Ware, ''Fluctuation Mitigation and Azimuthal Velocity Profile Regulation by Extremum Seeking in HELCAT'', *IEEE 25th Symposium on Fusion Engineering (SOFE),* San Francisco, California, USA, June 10-14, 2013.
15. **Z. Ilhan,** D. Huxley-Cohen, J. Barry et al, "Optimal Closed-Loop Control of the Azimuthal Velocity Profile in HELCAT by E×B Actuation", *54th Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS)*, Providence, Rhode Island, USA, October 29-November 2, 2012.
16. **Z. Ilhan,** E. Schuster, S. Xie, M. Gilmore, and A. Ware, "Optimal Azimuthal Velocity Profile Control by E×B Actuation in HELCAT", *53rd Division of Plasma Physics (DPP) Annual Meeting of the American Physical Society (APS),* Salt Lake City, Utah, USA, November 14-18, 2011.

ADVISING UNDERGRADUATE RESEARCH & SENIOR DESIGN

1. S. Lee, P. Nguyen, M. White, and **Z. Ilhan**, "Mechanism-Control Design Integration for a Gravity Compensation System for Human Lower Limb Rehabilitation", *Senior Design,* Fall 2022 & Spring 2023.
2. B. Westwick, W. Loveland, and **Z. Ilhan**, "Design and Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", *Senior Design,* Fall 2021 & Spring 2022.
3. N. Warner, B. Vidal, **Z. Ilhan**, "Analysis of Heat Transfer in a Disc Brake System", *MSU Texas Undergraduate Research Opportunities and Summer Workshop (UGROW),* 2021.
4. S. Edwards and **Z. Ilhan**, "Photogrammetry-Based 3D Printing: Applications in Engineering and Beyond", *Undergraduate Research and Creative Activities (EURECA)*, Spring 2021.
5. T. Green, N. Inge, G. Junkere, C. Simeon, and **Z. Ilhan**, "Design and Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation*", Senior Design,* Fall 2020 & Spring 2021.
6. J. Baker and **Z. Ilhan**, "Design and Implementation of Linear and Nonlinear Controllers to Stabilize an Experimental Test Setup", *Undergraduate Research and Creative Activities (EURECA)*, Spring 2020.
7. R. Stuart, J. Gillis, T. Hardee, C. Park, C. Palmore, **Z. Ilhan**, B. Schaffner, and J. Arbuckle, "Design of a Rotating Assembly Fixture for Power Take-Off Units*", Senior Design,* Fall 2019 & Spring 2020.
8. J. Cognasi, J. Perkins, J. Randall, M. Ronoh, J.T. Ok, and **Z. Ilhan**, "Automated Grow Light System for Biological Research*", Senior Design,* Fall 2019 & Spring 2020.
9. W. Loveland and **Z. Ilhan**, "Design of an Experimental Setup for Proportional-Integral-Derivative (PID) Control Tuning", *Undergraduate Research and Creative Activities (EURECA)*, Fall 2019.
10. C. LaRonde and **Z. Ilhan,** "Adaptive Control Design for a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", *Undergraduate Research Opportunities and Summer Workshop (UGROW),* 2019.

GRANTS & SPONSORED RESEARCH

1. **Z. Ilhan (PI),** P. Pokharel (co-PI), M. Elsharafi (co-PI), *Howmet Aerospace Foundation:* "Young Engineer Summer (YES) Camp", June 24-28 2024, $20,000.00 (acquired).
2. **Z. Ilhan (PI),** P. Pokharel (co-PI), M. Elsharafi (co-PI), *Howmet Aerospace Foundation:* "Young Engineer Summer (YES) Camp", June 26-30 2023, $20,000.00 (acquired).
3. S. Azzouz (PI), **Z. Ilhan (co-PI),** P. Pokharel (co-PI), *Howmet Aerospace Foundation:* "Young Engineer Summer (YES) Camp", June 20-24 2022, $20,000.00 (acquired).
4. S. Azzouz (PI), **Z. Ilhan (co-PI),** P. Pokharel (co-PI), *Howmet Aerospace Foundation:* "Young Engineer Summer (YES) Camp", June 21-25 2021, $20,000.00 (acquired).
5. **Z. Ilhan (PI),** *MSU Texas Intramural Grant*: "Nonlinear, Sliding-Mode Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", 2019-2021, $3,902.24 (acquired).

INDUSTRY CONSULTATIONS

WPT Power Corporation, Wichita Falls, TX

- Design of a Rotating Fixture for Power Take-Off (PTO) Units *Aug 2019 – May 2020*
- Modeling and Calculation of the Hydraulic Pressure Force in a Clutch *Dec 2019*

AWARDS & HONORS

Midwestern State University, Wichita Falls, TX

- Professor of the Year Award – McCoy School of Engineering *Apr 2024*
- Professor of the Year Award – McCoy School of Engineering *Apr 2018*

Lehigh University, Bethlehem, PA

- Rossin Doctoral Fellowship Award *Aug 2010*

SERVICE TO DEPARTMENT

Director: "Young Engineer Summer (YES) Camp Committee" ***Jun 2023 - present***

- Administered the grant application and assessment processes.
- Organized workshops for local middle-high school students.

Member: "Young Engineer Summer (YES) Camp Committee" ***Jun 2021 & Jun 2022***

- Served as a co-PI and a member of the organization committee.
- Organized workshops for local middle-high school students.

Member: "ABET Criterion 5 Committee" ***Mar 2020 – July 2020***

- Drafted the sub-section on "Broad Education Component".
- Prepared the ABET-compatible syllabus templates.

Student Recruitment Events: ***Mar 2019 – Present***

- Wichita Falls ISD Events
- MSU Texas Football
- MSU Texas Mustang Rallies

SERVICE TO UNIVERSITY

***Advisory Committee Member*: "First-Year Mustangs Adventure"** **Aug 2022 – Present**

- *Purpose: Prepare new students for academic success and engagement to improve retention.*
- Assisting with the curriculum development and assessment of the new freshman seminar class.
- Serving as a faculty mentor of the two sections of the new freshman seminar class.

***Reviewer/Evaluator*: "Undergraduate Research (EURECA) Program"** **Aug 2018 – Present**

- Reviewed numerous faculty research proposals.
- Evaluated numerous presentations in the University Research Forums.
- Served as a Moderator in the Fall 2018 University Research Forum.

SERVICE TO PROFESSION

***Session Chair*: "Oklahoma State University Mechatronics Conference"**

- Technical Session Chair: *"Smart Adaptive Structures"* *Sep 29, 2023*
- Technical Session Chair: *"Robotics in Healthcare"* *Oct 01, 2021*
- Poster Session Chair: *"Mechatronics in Education"* *Oct 22, 2020*

***Topic Chair/Co-chair*: "ASME IMECE Conference"**

- Topic Chair: *"Mechatronics, Automation, Robotics, and Control Engineering"* *Oct 31, 2023*
- Topic Co-chair: *"Distance/Online Engineering Education"* *Oct 31, 2023*
- Topic Co-chair: *"Distance/Online Engineering Education"* *Nov 03, 2022*
- Topic Co-chair: *"Applied Mechanics, Dynamic Systems and Control Engineering"* *Nov 03, 2022*
- Topic Co-chair: *"Teaching Laboratories and Technology-Aided Lecturing"* *Nov 03, 2022*

SERVICE TO COMMUNITY

***Tutor/Guest Lecturer*:**

- Boys Scouts of America - Engineering Merit Badge *Mar 2021 – Present*
- River Bend Nature Center *Oct 26, 2019*

***Judge/Evaluator*:**

- TAME Annual STEM Competitions *Feb 2021 – Present*
- TCEA Area 9 Robotics Competitions *Jan 2019 – Jan 2023*
- FIRST Tech Challenge Robotics Competition Vernon, TX *Nov 2021 – Nov 2022*

EXTRACURRICULAR ACTIVITIES

***Flute Player & Member*:**

- MSU Texas Orchestra & Wind Ensemble *Aug 2017 – May 2019*
- Lehigh University Orchestra & Wind Ensemble *Aug 2010 – May 2016*
- Municipal Band of Bethlehem, PA *May 2015 – Aug 2016*
- Kappa Kappa Psi – National Honorary Band Fraternity *May 2011 – Aug 2016*