

Zeki Okan Ilhan, PhD

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EDUCATION

Lehigh University, Bethlehem, PA

Ph.D. in Mechanical Engineering – Nuclear Fusion and Controls 09/2016

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 06/2010

PROFESSIONAL EXPERIENCE

Midwestern State University, Wichita Falls, TX

Assistant Professor 2018 - present

Visiting Assistant Professor 2017-2018

US Coast Guard Academy, New London, CT

Mechanical Engineering Lecturer 01/2017 - 06/2017

Princeton Plasma Physics Laboratory, Princeton, NJ

Visiting Researcher 06/2015 - 08/2015

TEACHING RESPONSIBILITIES

Midwestern State University, Wichita Falls, TX

Introduction to Engineering Fall 2017 - present

Engineering Graphics Fall 2017 - present

Solid Modeling Spring 2019 - present

Statics Fall 2017- present

Engineering Economics Fall 2017 & Fall 2018

Mechanics of Solids Summer I 2019 - present

Senior Design Lab I&II Fall 2019 - present

Mechanical Engineering Analysis Spring 2018 - present

Control Systems Spring 2018 - present

FE Exam Review Sessions: Mathematics & Statics Spring 2018 - present

US Coast Guard Academy, New London, CT

Modeling and Control of Dynamic Systems Spring 2017

Engineering Materials Science Labs Spring 2017

Lehigh University, Bethlehem, PA

Mechanical Vibrations (TA & Recitation Leader) Spring 2013

Mechanical Engineering Laboratory I (TA & Lab Assistant) Spring 2013

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 ExB 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 & Exposition. 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.
<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>

PEER-REVIEWED CONFERENCE PROCEEDINGS (cont'd)

6. **Z. Ilhan**, W. Loveland, & J. Baker, "Design of a Simple Experimental Setup for P-I-D 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 ExB 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**, 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
2. 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.
3. **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
4. 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
5. 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.
6. **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.

CONFERENCE ABSTRACTS & POSTER PRESENTATIONS (cont'd)

7. **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.
8. **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.
9. **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.
10. **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.
11. **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.
12. **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.
13. **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.
14. **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.
15. **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.

GRANT WRITING & ACQUISITION

1. S. Azzouz (PI), **Z. Ilhan (co-PI)**, P. Pokharel (co-PI), *Howmet Aerospace Foundation: "Young Engineers Summer (YES) Camp"*, June 20-24 2022, \$20,000.00 (acquired).
2. S. Azzouz (PI), **Z. Ilhan (co-PI)**, P. Pokharel (co-PI), *Howmet Aerospace Foundation: "Young Engineers Summer (YES) Camp"*, June 21-25 2021, \$20,000.00 (acquired).
3. **Z. Ilhan (PI)**, *MSU Texas McCoy School of Engineering (MCOSME) Endowment: "Test Setups to Supplement Control Systems Class"*, October 1, 2020, \$2,300.57 (applied).
4. **Z. Ilhan (PI)**, *MSU Texas Office of Sponsored Programs and Research (OSPR) Intramural Grant: "Nonlinear, Sliding-Mode Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation"*, 2019-2021, \$3,902.24 (acquired).

ADVISING UNDERGRADUATE RESEARCH (EURECA & UGROW)

1. 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.
2. S. Edwards and **Z. Ilhan**, "Photogrammetry-Based 3D Printing: Applications in Engineering and Beyond", *Undergraduate Research and Creative Activities (EURECA)*, Spring 2021.
3. 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.
4. 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.
5. 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.
6. L. Teurlinx and **Z. Ilhan**, "Dynamics and Control of a Gravity Compensation Mechanism for Human Lower Limb Rehabilitation", *Undergraduate Research and Creative Activities (EURECA)*, Spring 2019.

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

1. American Society of Mechanical Engineers (ASME)
2. Council of Undergraduate Research (CUR)

INDUSTRY CONSULTATIONS

WPT Power Corporation, Wichita Falls, TX

1. Analysis of Heat Transfer in a Disc Brake System, June 2021.
2. Modeling and Calculation of the Hydraulic Pressure Force in a Clutch, December 2019.

SERVICE ACTIVITIES

Within Institution:

1. Committee Service: First Year Council (FYC) for improving freshman experience.
2. Faculty Advisor: American Society of Mechanical Engineers (ASME) Student Chapter.
3. Evaluator/Moderator: EURECA, UGRCAF.
4. Ad-Hoc Department Committee Member: YES Camp, ABET Criterion 5 (Curriculum & Syllabi)
5. Academic Advisor: Advising 10 undergraduate students currently.
6. Student Recruitment: MSU Football, Mustangs Rally, WFISD

Within Profession/Discipline:

1. Session Chair/Co-Chair: Oklahoma State University (OSU) Mechatronics Conference.
2. Topic Organizer/Co-organizer: ASME International Mechanical Engineering Congress and Exposition

Community Service:

1. Judge: Texas Alliance in Minorities in Engineering (TAME) Annual STEM Competitions.
2. Judge: Texas Computer Education Association (TCEA) Robotics Competitions.
3. Guide: Boys Scouts of America - Engineering Merit Badge.

AWARDS & HONORS

1. Professor of the Year Award – McCoy School of Engineering, 2018.