

# TAEKSANG LEE

Myongji University  
Department of Mechanical Engineering  
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## EDUCATION

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- 2016-2020 **Purdue University**, West Lafayette, IN, USA  
Ph.D. in Mechanical Engineering  
Advisor: Prof. Adrian Buganza Tepole  
Dissertation: Improving Reconstructive Surgery through Computational Modeling of Skin Mechanics
- 2014-2016 **Sungkyunkwan University**, Suwon, S. Korea  
M.S. in Mechanical Engineering  
Advisor: Prof. Moon Ki Kim  
Thesis: A Direct Methodology for Prediction of Creep Life Based on Small Punch Creep Test
- 2008-2014 **Sungkyunkwan University**, Suwon, S. Korea  
B.S. in Mechanical Engineering

## EMPLOYMENT AND RESEARCH EXPERIENCE

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- 2021-present **Assistant Professor**  
Department of Mechanical Engineering, Myongji University, Yongin, S. Korea
- 2020-2021 **Staff Engineer**  
Mechatronics R&D Center, Samsung Electronics Co., Ltd, Hwaseong, S. Korea
- 2016-2020 **Research Assistant**  
School of Mechanical Engineering, Purdue University, West Lafayette, IN, USA
- Summer 2015 **Visiting Student** (sponsored by **BK21 plus**)  
Multiscale Biofabrication and Tissue Engineering Laboratory  
University of Washington at Seattle, Seattle, WA, USA
- 2014-2016 **Research Assistant**  
School of Mechanical Engineering, Sungkyunkwan University, Suwon, S. Korea

Fall 2013      **Undergraduate Research Assistant**  
School of Mechanical Engineering, Sungkyunkwan University, Suwon, S. Korea

Winter 2012   **Internship**  
Machinery Design Team, Samsung Heavy Industries Co., Ltd, Geoje, S. Korea

## **JOURNAL PUBLICATIONS**

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- [20] Ro, U., Kim, S., Kim, M. K., and **Lee, T.**, “Creep Constitutive Modeling using Gaussian Process Regression: A Case Study on 9Cr-1Mo Steel,” *Under review*.
- [19] Kim, Y. H.<sup>#</sup>, Kim, M. K.<sup>#</sup>, Suhr, J., **Lee, T.**, and Kim, M. K., “Exploring the Effect of Heat Treatment on the Mechanical Performance of 17-4PH Stainless Steel Specimens fabricated by Metal Additive Manufacturing,” *Under review*.
- [18] Kim, S., Ro, U., **Lee, T.**, and Kim, M. K., “Evaluation of Creep Properties considering the Friction Effect of the Small Punch Test,” *Engineering Fracture Mechanics*, Vol. 298, 109879, 2024
- [17] Song, G., Gosain, A. K., Buganza Tepole, A., Rhee, K., and **Lee, T.**, “Exploring Uncertainty in Hyper-viscoelastic Properties of Scalp Skin through Patient-specific Finite Element Models for Reconstructive Surgery,” *Computer Methods in Biomechanics and Biomedical Engineering*, pp.1-15, 2024
- [16] Han, T., Ahmed, K. S., Gosain, A. K., Buganza Tepole, A., and **Lee, T.**, “Multi-Fidelity Gaussian Process Surrogate Modeling of Pediatric Tissue Expansion,” *Journal of Biomechanical Engineering*, Vol. 144(12), 121005, 2022
- [15] Song, G., An, J., Buganza Tepole, A., and **Lee, T.**, “Bayesian Inference with Gaussian Process Surrogates to Characterize Anisotropic Mechanical Properties of Skin from Suction Tests,” *Journal of Biomechanical Engineering*, Vol. 144(12), 121003, 2022
- [14] Kim, S., Ro, U., Kim, Y. H., **Lee, T.**, and Kim, M. K., “Evaluation of Creep Properties using Small Punch Creep Test for modified 9Cr-1Mo Steel,” *Journal of Mechanical Science and Technology*, Vol. 36, pp. 4549–4561, 2022
- [13] Han, T.<sup>#</sup>, **Lee, T.**<sup>#</sup>, Ledwon, J. K., Vaca, E. E., Turin, S. Y., Kearney, A., Gosain, A. K., and Buganza Tepole, A., “Bayesian Calibration of a Computational Model of Tissue Expansion based on a Porcine Animal Model,” *Acta Biomaterialia*, Vol. 137, pp.136-146, 2022
- [12] **Lee, T.**, Holland, M. A., Weickenmeier, J., Gosain, A. K., and Buganza Tepole, A., “The Geometry of Incompatibility in Growing Soft Tissues: Theory and Numerical Characterization,” *Journal of the Mechanics and Physics of Solids*, Vol. 146, 104177, 2021
- [11] Stowers, C., **Lee, T.**, Bilonis, I., Gosain, A. K., and Buganza Tepole, A., “Improving Reconstructive Surgery Design using Gaussian Process Surrogates to Account for Material Behavior Uncertainty,” *Journal of the Mechanical Behavior of Biomedical Materials*, Vol. 118, 104340, 2021
- [10] Enriquez, A., Libring, S., Field, T. C., Jimenez, J., **Lee, T.**, Park, H., Satoski, D., Wendt, M. K., Calve, S., Buganza Tepole, A., Solorio, L., Lee, H., “High-Throughput Magnetic Actuation Platform for Evaluating the Effect of Mechanical Force on 3D Tumor Microenvironment,” *Advanced Functional Materials*, Vol. 31(1), 2005021, 2021

- [9] **Lee, T.**<sup>#</sup>, Turin, S. Y.<sup>#</sup>, Stowers, C., Gosain, A. K., Buganza Tepole, A., “[Personalized Computational Models of Tissue-Rearrangement in the Scalp Predict the Mechanical Stress Signature of Rotation Flaps](#),” *The Cleft Palate-Craniofacial Journal*, Vol. 58(4), pp.438-445, 2021
- [8] Janes, L. E., Ledwon, J. K., Vaca, E. E., Turin, S. Y., **Lee, T.**, Buganza Tepole, A., Gosain, A. K., “[Modeling Tissue Expansion with Isogeometric Analysis: Skin Growth and Tissue Level Changes in the Porcine Model](#)”. *Plastic and Reconstructive Surgery*, Vol. 146(4), pp.792-798, 2020
- [7] **Lee, T.**, Bilonis, I., Buganza Tepole, A., “[Propagation of Uncertainty in the Mechanical and Biological Response of Growing Tissues using Multi-Fidelity Gaussian Process Regression](#),” *Computer Methods in Applied Mechanics and Engineering*, Vol. 359, 112724, 2020
- [6] **Lee, T.**, Gosain, A. K., Bilonis, I., Buganza Tepole, A., “[Predicting the Effect of Aging and Defect Size on the Stress Profiles of Skin from Advancement, Rotation and Transposition Flap Surgery](#),” *Journal of the Mechanics and Physics of Solids*, Vol. 125, pp.572-590, 2019
- [5] **Lee, T.**, Turin, S. Y., Gosain, A. K., Bilonis, I., Buganza Tepole, A., “[Propagation of Material Behavior Uncertainty in a Nonlinear Finite Element Model of Reconstructive Surgery](#),” *Biomechanics and Modeling in Mechanobiology*, Vol. 17(6), pp.1857-1873, 2018
- [4] **Lee, T.**, Turin, S. Y., Gosain, A. K., Buganza Tepole, A., “[Multi-View Stereo in the Operating Room Allows Prediction of Healing Complications in a Patient-specific Model of Reconstructive Surgery](#),” *Journal of Biomechanics*, Vol. 74, pp. 202-206, 2018
- [3] **Lee, T.**, Vaca, E. E., Ledwon, J. K., Bae, H., Topczewska, J. M., Turin, S. Y., Kuhl, E., Gosain, A. K., Buganza Tepole, A., “[Improving Tissue Expansion Protocols through Computational Modeling](#),” *Journal of the Mechanical Behavior of Biomedical Materials*, Vol. 82, pp. 224-234, 2018
- [2] **Lee, T.**<sup>#</sup>, Lee, H.<sup>#</sup>, Kang, S. J., Ibupoto, F. A., Lee, J. M., Lee, J. H., Kim, B. J., Choi, J. B., Bae, S., Kim, M. K., “[Small Punch Test and Simulation of HR3C Steel](#),” *Journal of Mechanical Science and Technology*, Vol. 32(7), pp. 3115-3121, 2018
- [1] **Lee, T.**, Ibupoto, F. A., Lee, J. H., Kim, B. J., Kim, M. K., “[A Direct Methodology for Small Punch Creep Test](#),” *Experimental Mechanics*, Vol. 56(3), pp. 395-405, 2016

(# DENOTES EQUAL CONTRIBUTION)

## CONFERENCE PRESENTATIONS

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- [39] Kim, S.<sup>\*</sup>, Ro, U., **Lee, T.**, Kim, M. K., “[Creep Damage Evaluation Method through Small Punch Test](#),” The 9th Korea Multi-Scale Mechanics 2023 Symposium, Yeosu, S. Korea, December, 2023
- [38] Kim, Y. H.<sup>\*</sup>, Kim, M. K., **Lee, T.**, Kim, M. K., “[Effect of Heat Treatment and Stacking Orientation on the Strength Properties of 3DP 17-4PH Stainless Steel](#),” The 9th Korea Multi-Scale Mechanics 2023 Symposium, Yeosu, S. Korea, December, 2023
- [37] **Lee, T.**<sup>\*</sup>, Song, G., Baek, G., Lee, J., Lee, J., Yitayew, R. G., “[Uncertainty Analysis in Hyper-viscoelastic Properties of Scalp Skin through Personalized Finite Element Models](#)”

- for [Reconstructive Surgery](#),” Joint Conference of the Korean Society of Biomechanics & Korean Society of Sport Biomechanics, Jeonju, S. Korea, December, 2023
- [36] [Lee, T.\\*](#), “[A Bayesian Approach to Characterizing Anisotropic Properties of Skin from Suction Tests](#),” The 12th Asian-Pacific Conference on Biomechanics, Kuala Lumpur, Malaysia, November, 2023
- [35] [Lee, T.\\*](#), Song, G., Buganza Tepole, A., “[Characterization of Anisotropic Mechanical Properties of Skin using a Suction Device and Bayesian Inference](#),” 17<sup>th</sup> US National Congress on Computational Mechanics, Albuquerque, New Mexico, July, 2023
- [34] Song, G.\* , Shim, G., Gosain, A. K., Buganza Tepole, A., [Lee, T.](#), “[Patient-specific Virtual Surgery Simulation using Finite Element Method](#),” 17<sup>th</sup> US National Congress on Computational Mechanics, Albuquerque, New Mexico, July, 2023
- [33] Song, G.\* , Shim, G., Lee, J., [Lee, T.](#), “[Uncertainty Analysis over Hyper-viscoelastic Parameters of Skin in Virtual Surgery Simulation](#),” The KSME Spring Conference, Busan, S. Korea, May, 2023
- [32] Kim, S.\* , Ro, U., [Lee, T.](#), Kim, M. K., “[Development of Creep Property Evaluation Method according to Friction of Small Punch Test](#),” The KSME Spring Conference, Busan, S. Korea, May, 2023
- [31] [Lee, T.\\*](#) , Song, G., “[Methodology to Measure Anisotropic Properties of Skin using Bayesian Inference](#),” The KSME Spring Conference, Busan, S. Korea, May, 2023
- [30] Song, G.\* , Shim, G., [Lee, T.](#), “[Uncertainty Analysis over Hyper-viscoelastic Properties through Patient-specific Virtual Reconstructive Surgery Simulations](#),” Spring Conference of the Korean Society for Precision Engineering, Jeju, S. Korea, May, 2023
- [29] [Lee, T.\\*](#) , “[Computational Modeling of Growth and Incompatibility of Soft Tissues using Finite Element Method](#),” Winter Conference of the Biomedical Engineering Society for Circulation, Seoul, S. Korea, December, 2022
- [28] Ro, U.\* , Kim, S., Kim, Y., [Lee, T.](#), Kim, M. K., “[Data-driven Creep Simulation based on Gaussian Process Regression for 9% Cr Steel](#),” International Mechanical Engineering Congress & Exposition, Columbus, Ohio, November, 2022
- [27] Song, G.\* , An, J., [Lee, T.](#), “[Personalized Computational Models of Scalp Tissue Rearrangement and Stress Analysis](#),” Joint Conference of the Korean Society of Biomechanics & Korean Society of Sport Biomechanics, Chungju, S. Korea, November, 2022
- [26] Song, G.\* , Buganza Tepole, A., [Lee, T.](#), “[Prediction of Mechanical Properties and Anisotropy of Skin through Bayesian Inference](#),” Joint Conference of the Korean Society of Biomechanics & Korean Society of Sport Biomechanics, Chungju, S. Korea, November, 2022
- [25] [Lee, T.\\*](#) , Buganza Tepole, A., “[Computational Modeling of Skin Growth induced by Tissue Expansion](#),” Joint Conference of the Korean Society of Biomechanics & Korean Society of Sport Biomechanics, Chungju, S. Korea, November, 2022
- [24] [Lee, T.\\*](#) , “[Uncertainty Analysis in Tissue Growth and Remodeling using Multi-fidelity Gaussian Process Metamodel](#),” Fall Conference of the Korean Society for Precision Engineering, Daegu, S. Korea, October, 2022
- [23] Song, G.\* , Buganza Tepole, A., [Lee, T.](#), “[Mechanical Characterization of Anisotropic Mechanical Properties of Skin using Suction Tests and Bayesian Inference](#),” Fall Conference of the Korean Society for Precision Engineering, Daegu, S. Korea, October, 2022

- [22] Song, G. \*, An, J., **Lee, T.**, “[Prediction of Stress Signature on Scalp using Personalized Computational Models of Reconstructive Surgery](#),” Fall Conference of the Korean Society for Precision Engineering, Daegu, S. Korea, October, 2022
- [21] Ro, U. \*, Kim, S., **Lee, T.**, Kim, M. K., “[Machine Learning based Parameter-free Creep Model for 9% Cr Steel](#),” The KSME Spring Conference, Busan, S. Korea, May, 2022
- [20] Song, G. \*, An, J., **Lee, T.**, “[Personalized Computational Model of Reconstructive Surgery including Viscoelastic Effect of Skin](#),” Spring Conference of the Korean Society for Precision Engineering, Jeju, S. Korea, May, 2022
- [19] **Lee, T.**\*, Buganza Tepole, A., “[Quantifying Incompatibility in Growing Tissues and Its Connection to Residual Stresses](#),” Summer Biomechanics Bioengineering Biotransport Conference, Virtual Meeting, June, 2020
- [18] **Lee, T.**\*, Bilionis, I., Buganza Tepole, A., “[Uncertainty Analysis of Skin Growth During Tissue Expansion Using Multi-Fidelity Gaussian Process Regression](#),” Summer Biomechanics Bioengineering Biotransport Conference, Virtual Meeting, June, 2020
- [17] Stowers, C. \*, **Lee, T.**, Bilionis, I., Buganza Tepole, A., “[Understanding the Effect of Material Behavior Uncertainty Including Anisotropy on the Biomechanics of Reconstructive Surgery Flaps Using Surrogate Models](#),” Summer Biomechanics Bioengineering Biotransport Conference, Virtual Meeting, June, 2020
- [16] **Lee, T.**, Turin, S. Y. \*, Stowers, C., Gosain, A. K., Buganza Tepole, A., “[Virtual Surgical Planning of Tissue Transfer: Welcome Multi-View Stereo and Finite Element Analysis](#),” 88th American Society of Plastic Surgeons (Plastic Surgery: The Meeting), San Diego, California, September, 2019
- [15] **Lee, T.**\*, Buganza Tepole, A., “[Gaussian Process Surrogate Model for Reconstructive Surgery Finite Element Analysis](#),” 32<sup>nd</sup> US-Korea Conference on Science, Technology, and Entrepreneurship, Rosemont, Illinois, August, 2019
- [14] **Lee, T.**\*, Gosain, A. K., Bilionis, I., Buganza Tepole, A., “[Predicting the Effect of Aging and Flap Design on the Mechanical Stress Profiles of Skin Through Gaussian Process Surrogates](#),” 15<sup>th</sup> US National Congress on Computational Mechanics, Austin, Texas, July, 2019
- [13] **Lee, T.**, Rausch, M. K., Buganza Tepole, A. \*, “[Personalized Simulation of Reconstructive Surgery in the Presence of Material Behavior Uncertainty](#),” Biomedical Engineering Society, Atlanta, Georgia, October, 2018
- [12] Turin, S. Y. \*, **Lee, T.**, Berg, P., Gosain, A. K., Buganza Tepole, A., “[Application of Finite Element Analysis to Predict Skin Mechanical Stress on a Patient-Specific Model of Complex Local Tissue Rearrangement](#),” 10<sup>th</sup> Biennial World Society for Simulation Surgery Meeting, Chicago, Illinois, September, 2018
- [11] **Lee, T.**\*, Turin, S. Y., Gosain, A. K., Bilionis, I., Buganza Tepole, A., “[Quantifying the Effect of Material Parameter Uncertainty in Patient-Specific, Physics-based Modeling of Reconstructive Surgery](#),” World Congress of Biomechanics, Dublin, Ireland, July, 2018
- [10] **Lee, T.**\*, Vaca, E. E., Ledwon, J. K., Bae, H., Topczewsak, J. M., Turin, S. Y., Kuhl, E., Gosain, A. K., Buganza Tepole, A., “[Quantifying Skin Growth due to Tissue Expansion as a Function of Inflation Volume and Protocol Duration](#),” World Congress of Biomechanics, Dublin, Ireland, July, 2018
- [9] **Lee, T.**, Vaca, E. E., Ledwon, J. K., Bae, H., Topczewsak, J. M., Turin, S. Y., Kuhl, E., Gosain, A. K., Buganza Tepole, A. \*, “[Understanding Skin Growth in Response to Stretch at Multiple Scales](#),” Engineering Mechanics Institute conference, Boston, Massachusetts, May, 2018

- [8] Vaca, E. E. \*, Buganza Tepole, A., **Lee, T.**, Ledwon, J. K., Bae, H., Topczewska, J. M., Gosain, A. K., “[Modeling Tissue Expansion with Isogeometric Analysis: Skin Growth is Correlated with Increased Latency After Expansion](#),” Plastic Surgery Research Council 62<sup>nd</sup> Annual Meeting, Durham, North Carolina, May, 2017
- [7] Kim, M. K. \*, **Lee, T.**, Lee, J. H., Bae, S., “[A Novel Approach of Small Punch Creep Test](#),” International Mechanical Engineering Congress & Exposition, Phoenix, Arizona, November, 2016
- [6] **Lee, T.** \*, Kim, M. K., “[An Advanced Creep Life Prediction Method based on Small Punch Creep Test](#),” The KSME Spring Conference, Jeju, South Korea, April, 2016
- [5] **Lee, T.** \*, Choi, J. B., Kim, M. K., “[Creep Life Prediction of Pressure Vessels Based on Small Punch Creep Test](#),” The KPVP Annual Conference, Gimcheon, South Korea, November, 2015
- [4] **Lee, T.** \*, Kim, M. H., Kim, M. K., “[Study on Equivalent Strain Analysis of Small Punch Creep Test Based on Membrane Stretching Theory](#),” The KSME Autumn Conference, Jeju, South Korea, November, 2015
- [3] **Lee, T.** \*, Choi, J. B., Kim, M. K., “[Analytical Study on Small Punch Creep Test for Creep Life Prediction](#),” Mechanical Engineering Seminar, Suwa, Japan, March, 2015
- [2] **Lee, T.** \*, Lee, J. H., Kim, B. J., Kim, M. K., Lim, B. S., Ibupoto, F. A., “[Development of a Creep Life Time Expectation Method Based on Small Punch Creep Test](#),” The KIMM Spring Conference, Daegu, South Korea, April, 2014
- [1] Lee, J. H., Kim, M. K., Kim, B. J., **Lee, T.** \*, Lim, B.S., “[Small Punch Creep Test Methodology and Life Evaluation](#),” The 2<sup>nd</sup> ACCEE, Phuket, Thailand, March, 2014

(\* DENOTES PRESENTING AUTHOR)

## **INVITED TALKS AND SEMINARS**

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- [7] “[Computational Modeling and Uncertainty Analysis of Skin Growth induced by Tissue Expansion](#),” The 9th Korea Multi-Scale Mechanics 2023 Symposium, Yeosu, S. Korea, December, 2023
- [6] “[Predictive Modeling and Simulation for Soft Tissue Mechanics](#),” School of Mechanical Engineering at Yonsei University, Seoul, S. Korea, May, 2023
- [5] “[Predictive Modeling of Soft Tissue Mechanics](#),” Department of Mechanical & System Design Engineering at Hongik University, Seoul, S. Korea, April, 2023
- [4] “[Computational Modeling of Skin Mechanics and Uncertainty Analysis in Mechanical and Biological Response of Skin](#),” School of Mechanical Engineering at Sungkyunkwan University, Suwon, S. Korea, May, 2022
- [3] “[Computational Modeling of Skin Mechanics and Uncertainty Analysis in Mechanical and Biological Response of Skin](#),” Korean Society of Medical and Biological Engineering, Virtual Conference, May, 2022
- [2] “[Computational Modeling of Skin Mechanics and Uncertainty Analysis in Mechanical and Biological Response of Skin](#),” Spring Conference of the Korean Society for Precision Engineering, Jeju, S. Korea, May, 2022
- [1] “[Development of Virtual Surgery Simulation using Patient-specific Modeling and Study on the Effect of Uncertainty over Mechanical Properties of Skin](#),” Annual Conference of the Korean Society of Biomechanics, Seoul, S. Korea, December, 2021

## **AWARDS AND HONORS**

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2023	<b>Yamaguchi Medal in the field of tissue biomechanics</b> , Asian-Pacific Association for Biomechanics
2022	<b>Best paper award</b> , Korean Society of Biomechanics
2020	<b>KSEA-KUSCO Graduate scholarship</b> , Korean-American Scientists and Engineers Association
2019	<b>KSEA/KOSEN best poster award</b> , UKC 2019
2016	<b>Excellence award for oral presentation</b> , School of Mechanical Engineering, Sungkyunkwan University
2016	<b>Outstanding thesis award</b> , Sungkyunkwan University
Spring 2013	<b>Academic merit-based scholarship</b> , Sungkyunkwan University
Spring 2009	<b>Academic merit-based scholarship</b> , Sungkyunkwan University

## **RESEARCH INTERESTS**

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- **Computational solid mechanics:** Stress analysis for patient-specific model and generic flap design in reconstructive surgery based on nonlinear finite element analysis to elucidate effects of mechanical stress in wound healing and scar formation.
- **Soft tissue growth and remodeling:** Characterization of the mechanics and mechanobiology of tissue growth and remodeling using continuum mechanics and isogeometric analysis.
- **Uncertainty quantification:** Development of Bayesian surrogate models using Gaussian process regression with multi-level and multi-fidelity information; reduced order models to propagate uncertainty over mechanical and biological responses of soft tissues.
- **Numerical characterization:** Quantification of incompatibility by nonuniform growth field to reveal the interplay between biological growth and residual stress.

## **TEACHING EXPERIENCE**

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- **Machine Component Design**, Undergraduate Level  
Spring 2023  
Mechanical Engineering, Myongji University, Yongin, S. Korea
- **Applied Mathematics I**, Graduate Level  
Fall 2022, Fall 2023  
Mechanical Engineering, Myongji University, Yongin, S. Korea
- **Finite Element Method**, Undergraduate Level  
Spring 2022, Spring 2023  
Mechanical Engineering, Myongji University, Yongin, S. Korea

- **Solid Mechanics**, Undergraduate Level  
Spring 2022  
Mechanical Engineering, Myongji University, Yongin, S. Korea
- **Introduction to Engineering Design**, Undergraduate Level  
Fall 2021, Fall 2022, Fall 2023  
Mechanical Engineering, Myongji University, Yongin, S. Korea
- **Introduction to Finite Element Analysis**, Undergraduate Level  
Fall 2018, Spring & Fall 2019  
Teaching Assistant, Mechanical Engineering, Purdue University, West Lafayette, IN, USA
- **Solid Mechanics Design Laboratory**, Undergraduate Level  
Fall 2014, Spring & Fall 2015  
Teaching Assistant, Mechanical Engineering, Sungkyunkwan University, Suwon, S. Korea
- **Microstructure and Mechanical Properties**, Graduate Level  
Spring 2014  
Teaching Assistant, Mechanical Engineering, Sungkyunkwan University, Suwon, S. Korea

## **ACADEMIC SERVICE**

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- **Reviewer**  
Acta Biomaterialia, Engineering with Computers, International Journal of Precision Engineering and Manufacturing, Computer Methods and Programs in Biomedicine
- **Board Member**  
Korean Society of Biomechanics, Bio & Health section in Korean Society for Precision Engineering