**CURRICULUM VITAE**

NAME: Fuewen Frank Liou, Ph.D., ASME Fellow, SME Fellow

**PRESENT POSITION:**

### Michael and Joyce Bytnar Product Innovation and Creativity Professor, Mechanical Engineering,

### Director, Intelligent Systems Center

### Director, Manufacturing Engineering Program

Missouri University of Science and Technology (MS&T, formerly University of Missouri-Rolla)

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**EDUCATION:**

Ph.D., M.E. University of Minnesota, July 1987.

M.S., M.E. North Carolina State University at Raleigh, May 1984.

B.S., N.A.& M.E. National Cheng-Kung University, Taiwan, June, 1980.

**RESEARCH INTERESTS:**

Metal additive manufacturing (AM), Rapid prototyping, Multiscale multiphysics AM process modeling, Remanufacturing automation, Digital materials processing, Digital Twin, Digital Factory

**WORK EXPERIENCE:**

* Director, Intelligent Systems Center (ISC), MS&T, 2021-present
* Michael and Joyce Bytnar Product Innovation and Creativity Professor, Mechanical Engineering, 2011-present, MS&T
* Director, Manufacturing Engineering Program, 2000-present, MS&T
* Senior Research Investigator, Intelligent Systems Center(ISC), 2005- present, MS&T
* Faculty Research Investigator, Graduate Center for Materials Research (MRC), 2010-present.
* Professor, Mechanical Engineering, 1999-present, MS&T
* Co-founder, Product Innovation and Engineering (PINE), LLC, 2002-present
* Interim Program Coordinator, Manufacturing Engineering Program, 1998-2000, University of Missouri-Rolla
* Associate Professor, Mechanical Engineering, 1993-1999, University of Missouri-Rolla
* Boeing - A.D. Welliver Faculty Summer Fellow, Wichita and Seattle, Summer 1997
* Research Investigator, Intelligent Systems Center, 1993-2005, University of Missouri-Rolla
* Research Associate, Intelligent Systems Center, 1991-1993, University of Missouri-Rolla
* Assistant Professor, Mechanical Engineering, 1987-1993, University of Missouri-Rolla

**HONORS AND AWARDS:**

* Listed in Highly Ranked Scholars (top 0.5% of all scholars worldwide) by ScholarGPS, 2024-present.
* Outstanding Alumnus, Systems and Naval Mechatronics, National Cheng-Kung University, Taiwan, 2021.
* Fellow, Society of Manufacturing Engineers (FSME), 2021.
* Listed in World Top 2% cited scientists in their fields for career and yearly impact by Stanford University, 2020-present
* Tier One Faculty External Recognition Award at S&T, 2021
* SME Frederick W. Taylor Research Medal, 2020
* Distinguished Investigator Award, Intelligent Systems Center, Missouri S&T, 2019.
* Best Conference Paper Award, “A Framework for Process Inspection of Metal Additive Manufacturing,” 2018 IEEE International Conference on Applied System Innovation, Chiba, Tokyo, Japan, April 13-17, 2018, by Y Cheng; F. Liou; C. Cheng; and S. Shen.
* Keynote speech on “Metal Additive Manufacturing: Promises and Challenges” in the 2017 International Symposium on Optomechatronic Technology, Tainan, Taiwan, Nov 5-9, 2017.
* Distinguished Investigator Award, Intelligent Systems Center, Missouri S&T, 2015.
* “New materials, in 3-D” research is selected as 15 important innovations at Missouri S&T in 2015
* Best Paper award, the 2015 Solid Freeform Fabrication Symposium, Austin, Texas, 2015 (with Yan, L., X. Chen, W. Li, and J. Newkirk).
* “Manufacturing in 3-D” research is listed as one of the “13 Important Research Stories of 2013”, Missouri University of Science and Technology, 2013.
* Outstanding Faculty Research Award, Missouri S&T, 2011.
* Outstanding Scholar Award, Midwest Chinese–American Science and Technology Association (MCASTA), 2010.
* Keynote speech on “Rapid Manufacturing and Its Emerging Applications” in the 3rd International Forum on Systems and Mechatronics” (IFSM-2010, Singapore).
* Rapid Prototyping Journal Best Paper Award (poster presentation), 21st Solid Freeform Fabrication Symposium, (with Shyam Barua and T. Sparks) Austin, Texas, 2010.
* Society of Manufacturing Engineers (SME) Dick Aubin Distinguished Paper Award (with Mary Kinsella), 2009 (The selected paper must have a significant impact on rapid prototyping or additive manufacturing and must have practical value beyond pure research).
* Fellow, American Society of Mechanical Engineers (ASME), 2008.
* Highly Commended Paper Award for Rapid Prototyping Journal, selected by Emerald Literati Network Awards for Excellence 2008.
* ASEE Manufacturing Division Leadership Award, 2007, Honolulu, HI.
* Outstanding Teacher Award, University of Missouri-Rolla, 2005-06.
* Excellence in Teaching, School of Engineering, UMR, 2006.
* SFF Best Poster Paper Award, Solid Freeform Fabrication Symposium, (with K. Eiamsa-ard, H. Nair, L. Ren, J. Ruan, and T. Sparks) Austin, Texas, 2005.
* Faculty Performance Shares, University of Missouri-Rolla, September 2001.
* Academy of Mechanical Engineers Faculty Excellence Service Award, University of Missouri-Rolla, October 2000.
* ASME Best Paper Award, Applicon Best Paper Award for CAD/CAM Theory and Applications, ASME Design Automation Conference, (with K. Srikanth and S. N. Balakrishnan), Sept 16, 1997.
* Boeing - A.D. Welliver Faculty Fellow, 1997
* McDonnell Douglas Faculty Excellence Award, University of Missouri-Rolla, 1995-96
* McDonnell Douglas Faculty Excellence Award, University of Missouri-Rolla, 1994-95
* McDonnell Douglas Faculty Excellence Award, University of Missouri-Rolla, 1993-94
* Outstanding Faculty Advisor Award, Society of Automotive Engineering, 1994
* Outstanding Teacher Award, University of Missouri-Rolla, 1992-93
* Ralph R. Teetor Educational Award, Society of Automotive Engineering, 1990
* Certified Professional Engineer, Taiwan, 1980
* Listed in the Who’s Who Among Asian Americans
* Listed in the Who’s Who in Science and Engineering
* Listed in the International Who’s Who of Professionals
* Listed in the America’s Most Admired Men and Women
* Listed in the Who's Who in America

**Recent Advisee/Student Honors and Awards:**

* Mohammad Masud Parvez, Musarrat Farzana Rahman, Shaikat Galib and Frank Liou, “A Convolutional Neural Network (CNN) for Defect Detection of Additively Manufactured Parts,” ASME International Mechanical Engineering Congress and Exposition (IMECE) Conference, Machines Advanced Manufacturing, Best student paper award, Nov. 2021.
* Xinchang Zhang (PhDME), CEC Dean’s Ph.D. Scholar Award, Missouri S&T, 2019.
* Wenyuan Cui (PhDME), First place in Intelligent Systems Center’s (ISC) Research Symposium presentation (out of about 40 presentations), 2019.
* Tan Pan (MSME), Third place in Intelligent Systems Center’s (ISC) Research Poster presentation, 2019.
* Aaron Flood (PhDME), CEC Dean’s Graduator Educator Award, Missouri S&T, 2018.
* Wei Li (PhDME), CEC Dean’s Ph.D. Scholar Award, Missouri S&T, 2018.
* Freddy Wu, (MSSMAME), Best Student Presentation Award, 2017 International Symposium on Optomechatronic Technology, Tainan, Taiwan, Nov 5-9, 2017.
* Wei Li (PhDME), Third place in Intelligent Systems Center’s (ISC) Research Poster presentation (out of over 40 posters), 2016 and 2017.

**Professional Editorial Activities:**

* Associate Editor (2001-2008), SME Journal of Manufacturing Systems
* Associate Editor (2000-2007), Mechanism and Machine Theory, the journal of IFToMM - The International Federation for the Theory of Machines and Mechanisms

**PROFESSIONAL AFFILIATIONS:**

* Fellow, Society of Manufacturing Engineers (SME)
* Fellow, American Society of Mechanical Engineers (ASME)

**BOOK:**

* Liou, Fuewen Frank, Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development (Second Edition). CRC Press, 2019, ISBN-10: 1498798926, ISBN-13: 978-1498798921. [https://doi.org/10.1201/9780429029721](https://doi.org/10.1201/9780429029721" \t "_blank)

**REFEREED PUBLICATIONS: ORCID:** <https://orcid.org/0000-0001-9505-0841>

Articles in Book Chapters:

1. Huang, C.P., S. Agarwal, F. W. Liou, “Validation of the Dynamics of a Parts Feeding System Using Augmented Reality Technology,” Book chapter (Chapter 14) in *Virtual Reality and Augmented Reality Applications in Manufacturing*, edited by Ong, Soh K., Nee, A.Y.C., July 2004, Published by Springer, ISBN: 1-85233-796-62004.
2. Zhang, Jingwei, Lei Yan, Wei Li, , Frank Liou, “A Two-Dimensional Simulation of Grain Structure Growth Within Substrate and Fusion Zone During Direct Metal Deposition,” book chapter of Additive Manufacturing of High-performance Metals and Alloys - Modeling and Optimization, ISBN#978-1-78923-389-6, Comptes Rendus Mecanique, Académie des Sciences, 2018, DOI.org/10.5772/intechopen.73107.
3. Isanaka, Sriram Praneeth and Frank Liou, “Current Capabilities and Research Trends in Rapid and Virtual Prototyping,” Advances in Manufacturing and Processing of Materials and Structures, Chapter 4 in the book: ISBN 9781138035959, 2018, DOI.org/10.1201/b22020-4.
4. Flood, Aaron and Frank Liou, “Chapter 5: Modeling and Simulation of Metal AM,” 3D Printing, 978-1-78923-966-9, Dragan Cvetković, IntechOpen, 2018. DOI.org/ 10.5772/intechopen.78144. Available from: <https://www.intechopen.com/books/3d-printing/modeling-and-simulation-of-metal-am>.
5. Liu, Renwei, Zhiyuan Wang, and Frank Liou, “Additive Processes”, Chapter 7 of Handbook of Manufacturing, <https://doi.org/10.1142/9789813271029_0007>, September 2019.
6. Zhang, Xinchang, Frank Liou,“Chapter 1: Introduction to Additive Manufacturing,” Editor(s): Juan Pou, Antonio Riveiro, J. Paulo Davim, In Handbooks in Advanced Manufacturing, Additive Manufacturing, Elsevier, 2021, Pages 1-31, ISBN 9780128184110,

<https://doi.org/10.1016/B978-0-12-818411-0.00009-4>.

1. Boillat, Rachel; Sriram Praneeth Isanaka; Frank Liou, “Chapter 1: Introduction to Materials and Processes for Additive Manufacturing/Alloy Design and Materials Selection,” ASM International Handbook, Volume 24A, Additive Manufacturing Design and Applications, ISBN electronic: 978-1-62708-439-0, DOI: <https://doi.org/10.31399/asm.hb.v24A.a0006973>, 2023.
2. Muhammad Arif Mahmood, Sung-Heng Wu, Frank Liou, Kashif Ishfaq,”Chapter 2: Machine learning for design in additive manufacturing,” *Machine Learning for Powder-Based Metal Additive Manufacturing*, Elsevier, 978-0-443-22145-3, B978-0-443-22145-3.00002-5, <https://www.sciencedirect.com/science/article/abs/pii/B9780443221453000025>, 2025.

Articles in Refereed Journals:

1. Liou, F. W. and A. G. Erdman, "Analysis of A High-Speed Flexible Four-bar Linkage, Part I: Formulation and Solution" *ASME Journal of Vibration, Acoustics, Stress, and Reliability in Design*, vol. 111, pp.35-41, 1989.
2. Liou, F. W. and A. G. Erdman, "Analysis of A High-Speed Flexible Four-bar Linkage, Part II: Analytical and Experimental Results on the Apollo", *ASME Journal of Vibration, Acoustics, Stress, and Reliability in Design*, vol. 111, pp.42-47, 1989.
3. Liou, F. W. and A. G. Erdman, "Experimental Motion Analysis of a High-Speed Mechanism and Drive System by Using High-Speed Camera and Digital Imaging Technique," *Mechanism and Machine Theory Journal*, vol. 24, No. 4, pp. 257-266, 1989.
4. Liou, F.W., A.G. Erdman and C.S. Lin, "Dynamic Analysis of A Motor-Gear- Mechanism System," *Mechanism and Machine Theory*, vol. 26, No. 3, pp. 239-252, 1991.
5. Liou, F.W. and K.C. Peng, "Experimental Vibration Analysis of Mechanisms," *Shock and Vibration Digest*, vol. 24, No. 2, pp. 3-10, 1992.
6. Liou, F.W. and D.J. Suen, "The Development of a Feature-Based Fixture Planning System for Flexible Assembly," *Journal of Manufacturing Systems*, No. 2, vol. 11, pp. 102-113, 1992.
7. Liou, F.W. and K. C. Peng, "Experimental Frequency Response Analysis of Flexible Four-Bar Mechanisms," *Mechanisms and Machine Theory*, vol. 28, No. 1, pp. 73-81, 1992.
8. Liou, F.W. and J.D. Liu, "Optimal Design of Flexible Mechanisms Using Parametric Approach," *Computers and Structures*, vol. 45, No. 5-6, pp. 965-972, 1992.
9. Liou, F. W. and C. J. Lou, "An Efficient Design Algorithm for High-Speed Mechanisms under Multiple Constraints," *Computers and Structures*, vol. 44, No. 5, pp. 965-972, 1992.
10. Liou, F. W. and Abani Patra, "Development of An Advisory Expert System for Elastic Mechanism Design," *Computers and Structures*, vol. 46, No. 1, pp. 125-132, 1993.
11. Shao, J.W., F.W. Liou, and A. Patra, "A Contact Phase Model for the Analysis of Flexible Mechanisms Under Impact Loading," *Computers and Structures*, vol. 49, No. 4, pp. 617-624, 1993.
12. Liou, F.W. and E. Baghu, "Experimental Research in Elastic Mechanisms," *Modern Kinematics - Developments in the Last Forty Years*, John Wiley & Sons, Inc., pp. 383-387 and pp. 434-437, 1993.
13. Liou, F. W. and J. D. Liu, "A Parametric Study on the Design of Multi-Body Systems with Elastic Members," *Mechanisms and Machine Theory*, vol. 29, No. 8, pp. 1219-1231, 1994.
14. Liou, F. W. and Abani Patra, "An Advisory System for the Analysis and Design of Deformable Beam-Type Multi-Body Systems," *Mechanisms and Machine Theory*, vol. 29, No. 8, pp. 1205-1218, 1994.
15. Fang, Yong and F.W. Liou, "Dynamic Analysis of Three Dimensional Multi-Body Systems with Elastic Components," *Computers and Structures*, vol. 57, No. 2, pp. 309-316, 1995.
16. Meyer, R.T. and F.W. Liou, “Fixture Analysis Under Dynamic Machining,” *International Journal of Production Research*, vol. 35, No. 5, 1471-1489, 1997.
17. Fang, Yong and F.W. Liou, “Virtual Prototyping of Mechanical Assemblies With Deformable Components,” *Journal of Manufacturing Systems*, vol. 16, No. 3, pp. 211-219, 1997.
18. Fang, Yong and F.W. Liou, "Interactive Geometric Modeling and Simulation of Manufacturing Systems," *Concurrent Design of Products, Manufacturing Processes and Systems*, Chapman & Hall, Chapter 14, pp. 337-364, 1998.
19. Yeh, J. H. and F.W. Liou, "Contact Condition Modeling for Machining Fixture Setup Processes," *International Journal of Machine Tools and Manufacture,* vol. 39, pp. 787-803, 1999.
20. Albuquerque, V. A., F. W. Liou, andO. R. Mitchell, “Inspection Point Placement and Path Planning Algorithms for Automatic CMM Inspection,” I*nternational Journal of Computer-Integrated Manufacturing*, vol. 13, No. 2, pp. 107-120, 2000.
21. Laeng, J., J. G. Stewart and F. W. Liou, “Laser Metal Forming Processes For Rapid Prototyping – A Review” *International Journal of Production Research,* vol. 38, No. 16, 3973-3996, 2000.
22. Yeh, J. H. and F.W. Liou, "Clamping Fault Detection in A Fixturing System," *SME* *Journal of Manufacturing Processes,* vol. 2, No. 3, 194-202, 2000.
23. Srikanth, K., F.W. Liou and S.N. Balakrishnan, "An Integrated Approach for Assembly Tolerance Analysis," *International Journal of Production Research,* vol. 39, No. 7, 1517-1535, 2001.
24. Huang, C.P., S. Agarwal, F. W. Liou, “Calibration, Registration, and Preparation of An Augmented Reality Environment For Virtual Prototyping Of Dynamic Systems,” *Journal of Advanced Manufacturing Systems*. vol. 1 No. 1, pp. 19-36, 2002.
25. Zhang, Jun and F.W. Liou, “Adaptive Slicing for A Multi-axis Laser Aided Manufacturing Process,” *ASME Journal of Mechanical Design,* vol. 126, pp. 254-261, March 2004.
26. Han, L.J. and F. W. Liou, “Numerical Investigation of the Influence of Laser Beam Mode on Melt Pool” *International Journal of Heat and Mass Transfer*, 47, pp. 4385-4402, 2004.
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30. Pan, Heng and Frank Liou, “Numerical Simulation of Metallic Powder Flow in a Coaxial Nozzle for the Laser Aided Deposition Process,” *Journal of Materials Processing Tech*., Volume 168, Issue 2, 30 September 2005, Pages 230-244.
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37. Liou, Frank, Kevin Slattery, Mary Kinsella, Joseph Newkirk, Hsin-Nan Chou, Robert Landers, “Applications of a Hybrid Manufacturing Process for Fabrication and Repair of Metallic Structures,” *Rapid Prototyping Journal*, 2007, ISSN: 1355-2546, 2007 Volume: 13 Issue: 4 Page: 236 – 244 (Won Highly Commended Paper Award, selected by Emerald Literati Network Awards for Excellence in 2008).
38. Tang, Lie, Jianzhong Ruan, Robert G. Landers, and Frank Liou, “Variable Powder Flow Rate Control in Laser Metal Deposition Processes, “*ASME Journal of Manufacturing Science and Engineering*, August 2008, vol. 130, 041016-1 to 11, 2008.
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42. Nagel, Jacquelyn K. S. and Frank W. Liou, “Designing a Modular Rapid Manufacturing Process,” *ASME Journal of Manufacturing Science and Engineering*, Volume 132, Issue 6, 061006-1 to 061006-1, 2010.
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50. Adivarekar, Mihir and Frank Liou, “Developing a General Postprocessor for Multi-Axis CNC Milling Centers,” *Computer-Aided Design and Applications* (ISSN 1686-4360), PACE Volume 2, pp-57-68,10.3722/cadaps, 2012.
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56. Kumar, Vishwa V., F. W. Liou, S. N. Balakrishnan, Vikas Kumar, "Economical Impact of RFID Implementation in Remanufacturing: A Chaos-based Interactive Artificial Bee Colony Approach," Journal of Intelligent Manufacturing, DOI 10.1007/s10845-013-0836-9, October 2013.
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62. Amine, Tarak, Joseph Newkirk, and Frank Liou, “An investigation of the effect of laser deposition parameters on characteristics of multilayered 316 L deposits,” Int J Adv Manuf Technology, DOI 10.1007/s00170-014-5951-z, May 2014.
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71. Isanaka, Sriram Praneeth, Sreekar Karnati, Frank Liou, “Blown powder deposition of 4047 aluminum on 2024 aluminum substrates,” Manufacturing Letters 7 (2016) 11–14.
72. Francis, Romy, Joseph W Newkirk, Frank Liou, “Investigation of Forged-Like Microstructure Produced by A Hybrid Manufacturing Process,” Rapid Prototyping Journal, Vol. 22, Iss: 4, 2016.
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197. Wenyuan Cui, , Xinchang Zhang, Lan Li, Yitao Chen, Tan Pan, Frank Liou, “Fabrication and characterization of AlxCrCuFeNi2 high-entropy alloys coatings by laser metal deposition,” 25th International Conference on Production Research Manufacturing Innovation, August 9-14, 2019, Chicago, Illinois.
198. Lan Li, Lei Yan, Aaron Flood, Frank Liou,” Predictive Model for Thermal and Stress Field in Laser Powder Bed Fusion Additive Manufacturing Process –I,” 25th International Conference on Production Research Manufacturing Innovation, August 9-14, 2019, Chicago, Illinois.
199. Lan Li, Lei Yan, Aaron Flood, Frank Liou,” Predictive Model for Thermal and Stress Field in Laser Powder Bed Fusion Additive Manufacturing Process – II,” 25th International Conference on Production Research Manufacturing Innovation, August 9-14, 2019, Chicago, Illinois.
200. Vishwa Vijay Kumar and Frank Liou, “Cyber-enabled Product Life cycle Management - A Multi-agent Framework,” 25th International Conference on Production Research Manufacturing Innovation, August 9-14, 2019, Chicago, Illinois.
201. Arivu, Maalavan, Matthew Luebbe, Wenyuan Cui, Frank Liou, Haiming Wen, “Direct laser deposition of cobalt-free high- entropy alloys,” Materials Science & Technology 2019.
202. Xinchang Zhang, Tan Pan, Yitao Chen, Frank Liou, “Additive Manufacturing of Cu on 316L Stainless Steel via Inconel 718 Intermediate Layers,” Proceedings of the 2021 Solid Freeform Fabrication Symposium, August 2021.
203. Mohammad Masud Parvez, Musarrat Farzana Rahman, Shaikat Galib and Frank Liou, “A Convolutional Neural Network (CNN) for Defect Detection of Additively Manufactured Parts,” ASME IMECE conference, Machines Advanced Manufacturing, Best student paper award, 2021, <https://doi.org/10.1115/IMECE2021-70500>.
204. Manoj Kumar Reddy Rangapuram1, Mianqing Yang; Saheed Babalola; Joseph Newkirk; Laura Nicole Bartlett; Frank Liou; and K. Chandrashekhara, “A Multiphysics Modeling Approach to Assess the Powder Bed Characteristics of High Strength Steel in Selective Laser Melting,” Proceedings of the 2022 Solid Freeform Fabrication Symposium, July 2022, [doi.org/10.26153/tsw/44577](http://dx.doi.org/10.26153/tsw/44577).
205. Mianqing Yang; Mohammad Parvez; Todd Sparks; Saheed Babolola; Joseph Newkrik; Frank Liou; K Chandrashekhara, “Directed Energy Deposition Processing-Performance Relationship of AF9628,” Proceedings of the 2022 Solid Freeform Fabrication Symposium, July 2022, [doi.org/10.26153/tsw/44565](http://dx.doi.org/10.26153/tsw/44565).
206. Anilas Karimpilakkal, Joseph Newkirk, Jason L Schulthess, Frank Liou, “Design and development of equi-atomic high entropy alloys for use in irradiation environments,” INL/CON-23-75852-Rev000, Idaho National Laboratory (INL), Idaho Falls, ID, 2023.
207. Liou, Frank and Wei Li, “ A Framework for Digital Manufacturing with a Directed Energy Deposition Process,” Flexible Automation and Intelligent Manufacturing International Conference, FAIM 2023 Proceedings, Lecture Notes in Mechanical Engineering (LNME), 978-3-031-38241-3, June 18-22, 2023.
208. Wu, Sung-Heng; Usman Tariq; Ranjit Joy; Muhammad Arif Mahmood; Frank Liou, “Role of In-situ Monitoring Technique for Digital Twin Development using Direct Energy Deposition: Melt Pool Dynamics and Thermal Distribution,” Proceedings of the 2023 Solid Freeform Fabrication Symposium, August 2023.
209. Ranjit Joy, Sung-Heng Wu, Usman Tariq, Muhammad Arif Mahmood, Frank Liou, “Effect Of Inter-Layer Dwell Time on Residual Stresses in Directed Energy Deposition of High Strength Steel Alloy,” Proceedings of the 2023 Solid Freeform Fabrication Symposium, August 2023.
210. Ranjit Roy, Sung-Heng Wu, Usman Tariq, Sriram Praneeth Isanaka, Asad Malik, Muhammad Arif Mahmood, Frank Liou, “State-of-the-art Cyber-enabled Physical and Digital Systems Deployed in Distributed Digital Factory Using Additive and Subtractive Manufacturing Systems: Open, Scalable, and Secure Framework,” Proceedings of the 2023 Solid Freeform Fabrication Symposium, August 2023.
211. Usman Tariq, Ranjit Joy, Sung-Heng Wu, Muhammad Arif Mahmood, Michael M Woodworth, Frank Liou, “Optimization of Computational Time for Digital Twin in Directed Energy Deposition for Residual Stresses,” Proceedings of the 2023 Solid Freeform Fabrication Symposium, August 2023.
212. Kelley, J. P., J. W. Newkirk, L. N. Bartlett, T. Sparks, S. P. Isanaka, S. Alipour, and F. Liou, “Influence of Steel Alloy Composition on The Process Robustness of As-Built Hardness in Laser-Directed Energy Deposition,” Proceedings of the 2023 Solid Freeform Fabrication Symposium, August 2023.
213. Usman Tariq; Sung-Heng Wu; Muhammad Arif Mahmood; Frank Liou, “Exploring the Impact of Pre- and Post-heating on Residual Stresses in Laser-directed Energy Deposition: A Numerical Investigation,” Proceedings of the 2024 Solid Freeform Fabrication Symposium, August 2024.
214. Md Sazol Ahmmed; Asad Waqar Malik; Muhammad Arif Mahmood; Sriram Praneeth Isanaka; Frank Liou, “Feasibility Analyses of Distributed Digital Factories Integrating Additive and Subtractive Manufacturing: A Case Study,“ Proceedings of the 2024 Solid Freeform Fabrication Symposium, August 2024.
215. Sung-Heng Wu; Usman Tariq; Ranjit Joy; Muhammad Arif Mahmood; Frank Liou, “Predicting Melt Pool Thermal Distribution in Ti-6Al-4V Directed Energy Deposition Using Machine Learning,” Proceedings of the 2024 Solid Freeform Fabrication Symposium, August 2024.

**OTHER PUBLICATIONS**

Articles in National Conference Proceedings:

1. F. W. Liou and J.D. Liu, "Optimal Design of Flexible Mechanisms Using General Design Rules," *Proceedings of the First International Applied Mechanical Systems Design Conference*, p77.1-p77.7, June 11-14, 1989, Nashville, Tennessee.
2. J. H. Chien and F. W. Liou, "System Modelling and Vibration Reduction of A Flexible Beam Under Rotary Motion," *Proceedings of the First International Applied Mechanical Systems Design Conference*, p71.1-p71.6, June 11-14, 1989, Nashville, Tennessee.
3. K. Krishnamurthy, F. W. Liou, M. Mehta, J.H. Chien, and H.T. Liang, "Flexible Assembly," *Proceedings of the First International Applied Mechanical Systems Design Conference*, p46.1-p46.7, June 11-14, 1989, Nashville, Tennessee.
4. F. W. Liou and C. J. Lou, "A Heuristic Approach for the Design of Beam-Type Flexible Mechanisms," *Proceedings of the 1st National Conference on Applied Mechanisms and Robotics*, vol.1, 89AMR-4C-1, pp. 1-6, Cincinnati, Ohio, November 5-8, 1989.
5. F. W. Liou and H. T. Liang, "Microprocessor Based CAD/CAM Integration System Implemented with Five Bar Mechanism," *Proceedings of the 1st National Conference on Applied Mechanisms and Robotics*, vol. 1, 89AMR-6C-2, pp. 1-5, Cincinnati, Ohio, November 5-8, 1989.
6. F.W. Liou, "Experimental Research in Elastic Mechanisms," *Proceedings of the First Forty Years of Modern Kinematics Conference*, pp. 9.10-9.13, Brainerd, MN, July 20-23, 1991.
7. J.W. Shao, F.W. Liou, and A. Patra, "A Contact Phase Model for the Analysis of Flexible Mechanisms Under Impact Loading," *Proceedings of the 2nd National Applied Mechanisms and Robotics Conference*, VIIB, 1-1 to 1-7, Cincinnati, Ohio, November 3-6, 1991.
8. F.W. Liou, and K.C. Peng, "Experimental Investigation On Some Critical Design Parameters of Elastic Mechanisms," *Proceedings of the 2nd National Applied Mechanisms and Robotics Conference*, XB. 4-1, to 4-6, Cincinnati, Ohio, November 3-6, 1991.
9. Yong Fang and F.W. Liou, "Feature-Based Dynamic Analysis of Mechanisms," *Proceedings of the 1993 Applied Mechanisms & Robotics Conference*, IXB 1-1 to 1-7, 1993.
10. F.W. Liou and T.C. Chou, "An Advanced Motion Simulation System for Mechanical Assemblies," *Proceedings of the 1994 NSF Design and Manufacturing Grantees Conference*, pp. 177-178, 1994.
11. Yong Fang and F.W. Liou, "An Interactive Design Tool for Part-Feeding Systems," *Proceedings of the 1995 NSF Design and Manufacturing Grantees Conference*, pp. 99-100, 1995.
12. F.W. Liou and F.S. Lin, "Dynamic Analysis Of Mechanical Components Using Parallel Computing," *Proceedings of the 1996 NSF Design and Manufacturing Grantees Conference*, pp. 143-144, January 1996.
13. F. W. Liou, J. Zhang, W. F. Lu, H. L. Tsai, K. Krishnamurthy**,** S. Agarwal, O. R. Mitchell, K. Peaslee, V. Allada, **“**A Five-Axis Rapid Metal Forming System,” *Proceedings of the 1999 NSF Design and Manufacturing Grantees Conference*, IE-22-1 to 11, January 1999.

Conference Presentations (Abstracts only):

* F. W. Liou and A. G. Erdman, "An Experimental and Analytical Study of the Dynamic Response of the High-Speed Elastic Mechanism System, " *Proceedings of Army Workshop on Kinematics, Dynamics and Control of Mechanisms and Manipulators*, Rensselaer Polytechnic Institute, Troy, New York, June 25-27, 1986.
* F. W. Liou and A. G. Erdman, "Modelling and Experimental Verification of the Dynamic Effect of Flexible Links and DC Motor of a Mechanism System," *Proceedings of Nonlinear Vibrations, Stability, and Dynamics of Structures and Mechanisms workshop*, Air Force Office of Science Research/Army Research Office, VPI, Blacksburg, Virginia, March 23-25, 1987.
* F. W. Liou "Computer-Aided Design of Mechanisms-An Update," *Proceedings of Midwest American Chinese Science and Technology Conference*, St. Louis, Missouri, June 3-5, 1988.
* F.W. Liou and K.C. Peng, "Experimental Study on the Frequency Response of Flexible Mechanisms," *Proceedings of the Twenty-Second Midwestern Mechanics Conference*, Rolla, Missouri, pp. 477-478, October 6-9, 1991.
* Liou, F.W., “Rapid Forming of Parts with Functionally Gradient Materials,” *Proceedings of the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** June, 2000.
* Liou, F.W., “Process Implementation of Parts with Functionally Gradient Materials,” *presented in the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** June, 2001.
* Liou, F.W., “Process Planning of Multi-Axis Hybrid Manufacturing System,” *presented in the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** June, 2002.
* Liou, F.W., “Process Planning For Laser Micro-Machining,” *presented in the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** October 25, 2003.
* Frank Liou, Kevin Slattery, Joohyun Choi, Hsin-Nan Chou, Mary Kinsella, Joseph Newkirk, and Keith Young, “Research on A Hybrid Manufacturing Process for Aerospace Structures,” *Presented at the 2005 AeroMat Conference*, Orlando, FL, June 6-9, 2005.
* Frank Liou, Kevin Slattery, Joohyun Choi, Hsin-Nan Chou, Mary Kinsella, Joseph Newkirk, and Keith Young, “Research and Development of a Hybrid Manufacturing Process for Fabrication and Repair of Metallic Structures,” *Presented at the 2005 Defense Manufacturing Conference (DMC 2005)*, Orlando, FL, 28 November - 1 December 2005.
* Kevin Slattery, Hsin-Nan Chou, Mary Kinsella, Frank Liou, “Destructive Test of LAM Ti 5553 Specimens” *presented in the 17th Annual Aeromat Conference*, May 2006.
* Zhiqiang Fan, Frank Liou, J. W. Newkirk, “Multiscale Modeling of Transport Phenomena and Microstructure Evolution during Laser Deposition,” *Presented at the 2007 ASM AeroMat Conference & Expo*, June 26-27, 2007, Baltimore, MD.
* Zhiqiang Fan, Frank Liou, Kevin Slattery, Mary Kinsella, Joseph Newkirk, Hsin-Nan Chou, and Blake Slaughter, “Process Modeling and Prediction for Laser Metal Deposition,” *Presented at SAE 2007 AeroTech Congress & Exhibition*, September 17 – 20, 2007, Los Angeles, California.
* Hsin-Nan Chou, Zhiqiang Fan, Frank Liou, Kevin Slattery, Mary Kinsella, Joseph Newkirk, “Modeling of Transport Phenomena and Numerical Simulation of Lack of Fusion during Laser Deposition,” *AeroMat 2008 Conference and Exposition*, Jun 23-26, 2008.
* Frank Liou, Zhiqiang Fan, Hsin-Nan Chou, Kevin Slattery, James Sears, Mary Kinsella, and Joseph Newkirk, “Laser-Material Interaction Research in a Metal Deposition Process,” *Presented in the 2009 TMS Annual Meeting & Exhibition*, February 15-19, 2009, San Francisco, CA.
* Liou, F. “Modeling of A Hybrid Manufacturing System,” 2010 Midwest Chinese-American Science and Technology (MCASTA) Symposium, St. Louis, MO, Sep. 10, 2011.
* Liou, F, “What are the key measurement science barriers that prevent innovation in metal-based AM?,” Workshop on Measurement and Standards for Metals-based Additive Manufacturing December 4-5, 2012 at National Institute of Standards and Technology, Gaithersburg Campus, Gaithersburg, MD.
* Joseph Newkirk; Frank Liou; Karen Taminger; William Seufzer; Zhiqiang Fan; Harihar Sistla; Sreekar Karnati, “Modeling and Experimental Study of Advanced Materials for Aerospace,” Materials Science & Technology 2013, October 27-31, 2013: Montreal, QC.

**INVITED SEMINARS:**

1. "Flexible Assembly," Intelligent System Center Project Review Conference, University of Missouri-Rolla, with K. Krishnamurthy, March 17, 1988.
2. "Development of Flexible Fixtures for Automotive Manufacturing," invited seminar at General Motors Company, Detroit, August 2, 1988.
3. "Intelligent Blank Cutting and Scheduling," Westinghouse ABB, Jefferson City, Missouri, with G. Leininger, K. Krishnamurthy, and C. Dagli, June 6, 1989.
4. "Design of A Flexible Robotic Welding Cell," First Annual Intelligent Systems Center Industrial Liaison Program's Member Conference, St. Louis, Missouri, June 9, 1989.
5. "Automated Design of High-Speed Machinery," invited seminar at the Department of Mechanical Engineering, National Taiwan University, Taipei, Taiwan, July, 18, 1989.
6. "Computer-Aided Design and Manufacturing Research," Intelligent Systems Center Industrial Liaison Program Conference, Rolla, Missouri, June 27, 1991.
7. "Computer-Aided Fixture Design and Development," Intelligent Systems Center Industrial Liaison Program Conference, St. Louis, Missouri, April 7, 1992.
8. "Intelligent CAD/CAM Systems," a series of lectures at the Jianghan Petroleum Institute, Jiangling, Hubei, China, May 20-23, and May 27-29, 1992.
9. "Applications of AI Technology in Process Planning," invited seminar at the Zhejing University, Hangzhou, Zhejing, China, June 2, 1992.
10. "Automation of Packaging Machinery," invited seminar at the Benison & Co. LTD, Taipei, Taiwan, June 13, 1992.
11. "Computer-Aided Prototyping of Packaging Machinery," invited seminar at the Benison & Co. LTD, Taipei, Taiwan, June 2, 1993.
12. “Current Research Opportunities in the Manufacturing Area,” Ramada, Rolla (ISC Retreat), January 1995.
13. “Product Design and Development - Boeing Experience” Boeing, Wichita KS (July 28 ) and Seattle, WA (August 4), 1997.
14. “Future Engineering Education” Boeing, Seattle WA, Aug. 7 1997.
15. "Product Design and Development - Boeing Experience," MAEM Seminar, UMR October 8, 1997.
16. "Undergraduate Program Enhancement: Product Design and Development," UMR MAEM Industrial Advisory Board, October 30, 1997.
17. "Product Realization Process," Engineering Management 320, Guest Lecturer, UMR, November 20, 1997.
18. "Aircraft Design and Manufacturing," Civil Engineering Seminar, UMR, October 8, 1998.
19. "Rapid Product Realization," Watlow Electric Manufacturing Company, November 5, 1998.
20. "Augmented Reality and Rapid Manufacturing Research," General Motors, June 1999.
21. Liou, F.W., “Rapid Forming of Parts with Functionally Gradient Materials,” *Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** June, 2000.
22. Liou, F.W., “Process Implementation of Parts with Functionally Gradient Materials,” *presented in the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** June, 2001.
23. Jianzhong Ruan, Jun Zhang and Frank Liou, “Process planning for laser micro-machining,” *presented in the Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** October 2003.
24. F. Liou, “Laser Aided Manufacturing Processes (LAMP) Research” *Midwest Chinese American Science And Technology Conference, Modern Engineering Session****,*** August 2004.
25. F. Liou, “Feature Presentation: Manufacturing Engineering Research and Education Program at the Missouri University of Science and Technology”, 2008 Manufacturing Summit, Southwest Area Manufacturers Association (SAMA), Springfield, Missouri, April 23, 2008.
26. F. Liou, “Rapid Manufacturing and Some Emerging Applications,” Invited seminar, Chemical Engineering, Missouri University of Science and Technology, April 28, 2009.
27. F. Liou, “Rapid Manufacturing and Its Opportunities in Energy Area,” Invited seminar, Naval Architecture and Systems Engineering, National Cheng-Kung University, Tainan, Taiwan, June 24, 2009.
28. F. Liou, “Rapid Manufacturing and the Future of Product Development,” Invited seminar, Global Research lecture series, Missouri University of Science and Technology, Nov 5, 2009.
29. F. Liou “Rapid Manufacturing and Its Emerging Applications,” Keynote speech in the 3rd International Forum on Systems and Mechatronics” (IFSM-2010, September 6-9, 2010, River View Hotel, Singapore).
30. F. Liou “Rapid Manufacturing,” Invited Award Speech in the Midwest Chinese–American Science and Technology Association (MCASTA), September, 18, 2010.
31. Liou, F., “Laser Metal Deposition and Its Emerging Applications,” invited seminar by Industrial Technology Research Institute (ITRI), Tainan, Taiwan, March 30, 2011.
32. Liou, F., “Multiscale and Multiphysics Modeling of Additive Manufacturing of Advanced Materials -1,” NASA Langley Research Center, VA, July 7, 2011.
33. Liou, F. “Is modeling really useful and practical in product development?” National Cheng-Kung University on Dec. 23, 2011.
34. Liou, F. “Metal Additive Manufacturing and Its Industrial Applications” invited lecture at the 2012 Mechanics and System Engineering Research Forum, National Cheng-Kung University, Tainan, Taiwan on July 20, 2012.
35. Liou, F. “Industrial Research Collaborations in the USA” invited presentation at the 2012 Mechanics and System Engineering Research Forum, National Cheng-Kung University, Tainan, Taiwan on July 20, 2012.
36. Liou, F., "Advanced Additive Materials Modeling and Simulation - Multiscale and Multiphysics Modeling of Metal Deposition Processes," Additive Aerospace Summit 2013, Los Angeles, CA, October 16 - 18, 2013.
37. Liou, F., Fan, Z., Newkirk, J., Seufzer, W. and Taminger, K., "Modeling and its Applications to Metal Additive Manufacturing Processes," AeroMat 2013, Bellevue, WA, April 1 - 4, 2013.
38. Liou, Frank, Todd Sparks, and Heng Liu, “A Hybrid Manufacturing Process for Precision Metal Parts,” ASPE Dimensional Accuracy and Surface Finish in Additive Manufacturing in Berkeley, CA on April 13-16, 2014.
39. Liou, Frank, Joseph Newkirk, William Seufzer and Karen Taminger, “Multi‐scale Modeling and Simulation of Directed Energy Deposition Processes, “AeroMat 2014 in Orlando, FL on June 16-19, 2014.
40. Liou, F., "Process Modeling and Qualification of Metal Additive Manufacturing," Additive Aerospace Summit 2014, Los Angeles, CA, November 3-6, 2014.
41. Liou, F. “On Robotic 3-D Printing,” International Forum on Systems and Mechatronics, Tainan, Taiwan, Oct. 13, 2014.
42. Liou, F. “Precision Metal Parts with Hybrid Additive Manufacturing and Machining,” invited lecture at the Metal Additive Tutorial Workshop (June 23-24, 2015) in Austin, Texas.
43. Liou, F., “Multi-Physics, Multi-Scale Modeling of Directed Energy Deposition Processes,” invited lecture at Navy’s Structural Mechanics TIM meeting at Falls Church, VA, June 24-26, 2015.
44. Liou, F., “Hybrid Additive Manufacturing for Precision Metal Parts,” invited Penn State IE Colloquium Series, Pennsylvania State University at State College, PA, Oct. 1, 2015.
45. Liou, F., “Laser Deposition Technology for Additive Manufacturing and Repair,” invited lecture at the Additive Adoption for Aerospace Summit/Metal Additive Tutorial 2015 in Los Angeles, CA on Oct 26-Oct 28, 2015.
46. Liou, F. W., "Model-Based Qualification for Directed Energy Deposition Processes," 145th TMS Annual Meeting & Exhibition, Nashville, TN, February 16 - 18, 2016.
47. Liou, F., "Metal Additive Manufacturing," School of Engineering, National Cheng-Kung University, Tainan, Taiwan, June 16, 2016.
48. Liou, F., "Multiscale and Multiphysics Modeling of Metallic Additive Manufacturing," Joint Army-Navy-NASA-Air Force (JANNAF) Liquid Propulsion Subcommittee (LPS) Advanced Materials Panel meeting 2016, Jackson Center, Huntsville, AL, August 23 - 25, 2016.
49. Liou, F., "Hybrid Manufacturing Processes for Precision Metal Parts," Joint Army-Navy-NASA-Air Force (JANNAF) Liquid Propulsion Subcommittee (LPS) Advanced Materials Panel meeting 2016, Jackson Center, Huntsville, AL, August 23 - 25, 2016.
50. F Liou (with John Ziegert), “Inspection, Qualification, and Certification,” workshop on Advanced Hybrid Manufacturing–Integrating Technologies, CAM-IT meeting in Jackson Center, El Paso, TX, March 12-14, 2017.
51. F Liou, “Inspection Process for Additive Manufacturing,” Invited presentation, National Cheng Kung University, Tainan, Taiwan, June 8, 2017.
52. F Liou, “Discovery of Novel Materials Using Additive Manufacturing,” Invited presentation, Discover DSO Day (D3, DARPA’s Defense Sciences Office (DSO)), Arlington, Virginia, June 15, 2017.
53. F Liou, “Metal Additive Manufacturing, Monitoring and Control,” Invited presentation by USPTO (United States Patent and Trademark Office), Patent Examiners Technical Training Program, Alexandria, VA, June 27, 2017.
54. Hill, Leon, Todd Sparks, Frank Liou, “Development of A Hybrid Manufacturing Process for Precision Metal Parts,” 28th Solid Freeform Fabrication Symposium, Austin, Texas, August 6-9, 2017.
55. Zhang, Xinchang, Wenyuan Cui, Wei Li, Frank Liou, “Metallic components repair strategies using the hybrid manufacturing process,” 28th Solid Freeform Fabrication Symposium, Austin, Texas, August 6-9, 2017.
56. Liou, F., "Metal Additive Manufacturing Research – Laser Applications," Navair’s Additive Manufacturing Planning Meeting, Falls Church, VA, October 13, 2017.
57. Newkirk, J, and F Liou, “Investigation of Fabrication of Ti64 Components Using Hybrid Additive Manufacturing, TMS 2018, Phoenix, Arizona, March 11-15, 2018.
58. Sparks, T., A. Flood, and Liou, F., “Optimized Build Plate Design Tool for Metal Laser Powder Bed Additive,” presentation at Navair, Patuxent River, MD, March 19, 2018.
59. Liou, F. and J. Newkirk, “Development of Metal Additive Manufacturing Processes and Materials,” Idaho National Laboratory, Idaho Falls, ID, June 28, 2018.
60. Liou, F., "Laser Beam Manipulation and AM Processing for Fabrication and Repair of Metallic Structures," Navair Additive Manufacturing workshop, Falls Church, VA, Aug 8, 2018.
61. Frank Liou, “Additive Manufacturing of Aluminum Bellcrank,” invited presentation at Auburn University for 2018 Army/Navy Additive Manufacturing Workshop, Auburn, Alabama, Oct. 18, 2018.
62. Praneeth Isanaka and Frank Liou, “Innovative Processing Techniques for Additive Manufacture of 7000 Series Aluminum Alloy Components,” invited presentation at Navair, Patuxent River, MD, Nov. 19, 2018.
63. Liou, F., Invited talk on “Laser Beam Manipulation and Processing for Fabrication and Repair for Metallic Structures,” US-Australia Additive Manufacturing Technical Exchange at RMIT University Melbourne, Australia, on Dec. 4, 2018.
64. Liou, F., Invited talk on “Directed Energy Depositing a New Fe-Cr-Ni Alloy,” US-Australia Additive Manufacturing Technical Exchange at RMIT University Melbourne, Australia, on Dec. 4, 2018.
65. Liou, F., Invited talk on “Research Toward Precision Repair Automation,” US-Australia Additive Manufacturing Technical Exchange at RUAG Australia, Australia, on Dec. 5, 2018.
66. Liou, F., Invited talk on “Toward Qualification of Metal Additive Manufacturing Processes,” US-Australia Additive Manufacturing Technical Exchange at Defence Science and Technology, Australia, on Dec. 6, 2018.
67. Liou, F., Invited talk on “The Challenges and Applications of Metal Additive Manufacturing,” Mechanical Engineering, National Cheng Kung University, Tainan, Taiwan, Dec. 13, 2018.
68. Liou, F., Invited seminar on “Overview of Metal Additive Manufacturing,” Systems and Naval Mechatronic Engineering, National Cheng Kung University, Tainan, Taiwan, Dec. 14, 2018.
69. Liou, F., Invited presentation on “Additive Manufacturing for Future Product Design and Manufacturing,” Intelligent Manufacturing and Product Innovation Workshop, National Cheng Kung University, Tainan, Taiwan, June 26, 2019.
70. Liou, F., Invited presentation on “Fabrication of Ti-6Al-4V to SS316 Functionally Graded Material,” Navair Additive Manufacturing Workshop, Seattle, WA, July 16, 2019.
71. Liou, F., Invited presentation on “Multi-beam AM project,” Navair Additive Manufacturing Workshop, Seattle, WA, July 17, 2019.
72. Liou, F. “Metal Additive Manufacturing Research: Modeling, Planning, Processing, & Testing,” Idaho National Laboratory, Idaho Falls, ID, January 29-31, 2020.
73. F Liou, “Metal Additive Manufacturing: Digital Material Fabrication,” Invited presentation by USPTO Tech Fair (United States Patent and Trademark Office), Patent Examiners Technical Training Program, June 24, 2020.
74. F Liou, “Vision Statement: Integrative Manufacturing and Remanufacturing Technologies (iMart) to Spur Rural Development,” Research Symposium on Towards A Vision for an Engineering Research Center on Integrative Manufacturing and Remanufacturing Technologies to Spur Rural Development, Missouri S&T, Sep 3, 2020.
75. Liou, F., Invited (online) seminar on “Digital-material Fabrication Using Additive Manufacturing,” Systems and Naval Mechatronic Engineering, National Cheng Kung University, Tainan, Taiwan, Dec. 18, 2020.
76. F Liou, “The Future Repair Technologies with Additive Manufacturing Solutions,” Invited (online) presentation by USPTO Tech Fair (United States Patent and Trademark Office), Patent Examiners Technical Training Program, June 22, 2021
77. Liou, F., Invited seminar on “Digital-Material Manufacturing and Remanufacturing” Mechanical Engineering, University of Texas- Dallas, April 1, 2022.
78. Liou, F., presentation on “Digital-Material Fabrication Using Additive Manufacturing,” RAPID 2022, May 17, 2022.
79. Liou, F. and Wei Li, presentation on “A Framework for Digital Materials Fabrication Using Directed Energy Deposition Process,” Solid Freeform Fabrication Symposium, Austin, Texas, July 26, 2022.
80. F Liou, “The Future Repair Technologies with Additive Manufacturing Solutions,” Invited presentation by USPTO Tech Fair (United States Patent and Trademark Office), Patent Examiners Technical Training Program, June 22, 2022.
81. F Liou, “A Decentralized Digital Factory for Future Manufacturing,” Invited presentation by USPTO Tech Fair (United States Patent and Trademark Office), Patent Examiners Technical Training Program, June 14, 2023.
82. Frank Liou and Wei Li, “ A Framework for Digital Manufacturing with a Directed Energy Deposition Process,” Flexible Automation and Intelligent Manufacturing International Conference, FAIM 2023 Proceedings, June 18-22, 2023.
83. Frank Liou, “High-Performance Material Development Using Additive Manufacturing Process,” 2023 DoD Steels Summit in Niceville, FL, Nov 13-15, 2023.
84. Liou, F., Invited seminar on “Research and Development of A Decentralized Digital Factory for Future Manufacturing,” School of Engineering, National United University, Miaoli, Taiwan, Dec. 20, 2023.
85. Liou, F., Invited seminar on “Research and Development of A Decentralized Digital Factory for Future Manufacturing,” Systems and Naval Mechatronic Engineering, National Cheng Kung University, Tainan, Taiwan, Dec. 22, 2023.
86. F Liou, “A Digital Twin Development Strategy for Metal Additive Manufacturing,” Invited presentation by USPTO Tech Fair (United States Patent and Trademark Office), Patent Examiners Technical Training Program, September 5, 2024.

**GRANTS**:

**Research Grants/Contracts:**

1. "Development of A Flexible Robotic Welding Cell - Feasibility Study," $16,008, Westinghouse Electric Corporation, Missouri, 12/15/88-1/15/89, Role: Co-PI, (with Drs. K. Krishnamurthy and G. Leininger)
2. "Intelligent Blank Cutting and Scheduling Advisory System - Feasibility Study," $20,000, Westinghouse Electric Corporation, Missouri, 3/15/89-5/31/89, Role: Co-PI, (with Drs. K. Krishnamurthy, G. Leininger, and C. Dagli)
3. "Development of A Flexible Robotic Welding Cell - System Implementation," $77,814, Westinghouse Electric Corporation, Missouri, 6/1/89-1/31/90, Role: Co-PI, (with Drs. K. Krishnamurthy and G. Leininger)
4. "Analysis and Synthesis of the Slider-Crank Mechanism in a Diesel Engine," $32,355, Weldon Spring Endowment Fund, Missouri, 6/1/89-5/31/90, ROLE: PI, (with Dr. S. Haddad)
5. "Intelligent Blank Cutting and Scheduling Advisory System-Heuristic Optimization," $70,187, Westinghouse Electric Corporation, Missouri, 12/1/89-5/31/90, Role: Co-PI, (with Drs. K. Krishnamurthy, G. Leininger, A. Bahrami, and C. Dagli)
6. "FEA Advisory System I - Elastic Modeling," $60,000, Anheuser Busch/Metal Container Co., Missouri, 1/1/90-7/31/90, Role: Co-PI, (with Drs. Y.W. Kown, W. Lu, and G. Leininger)
7. "FEA Advisory System II - Elasto-Plastic Modeling," $ 115,510, Anheuser Busch/Metal Container Co., Missouri/MRTC, 8/1/90-1/31/91, Role: Co-PI, (with Drs. K. Chandra, W. Lu, and G. Leininger)
8. "Assistance Related to Robotic Spin/Bake Hot Plate System - High Precision Robotic Gripper Design and Implementation," $16,011, Brewer Science Inc., Missouri/ MRTC, 3/18/91-8/18/91, Role: Co-PI, (with Drs. K. Krishnamurthy, A. Bahrami, and C. Dagli)
9. "FEA Advisory System III - Geometric Nonlinearity Modeling," $81,655, Anheuser Busch/Metal Container Co., Missouri/MRTC, 1/1/91-12/31/91, Role: Co-PI, (with Drs. K. Chandra, W. Lu, and G. Leininger)
10. "FEA Advisory System IV - Dynamics Modeling," $81,655, Anheuser Busch/Metal Container Co., Missouri/MRTC, 1/1/92-12/31/92, Role: Co-PI (with Drs. K. Chandra and W. Lu)
11. "Automation of An Engine Sub-Assembly Workcell," $85,240, Ford Motor Co.,/MRTC, 6/1/92-6/30/93, role: PI.
12. "Dynamic Analysis of Mechanical Assemblies," $110,000, National Science Foundation/MRTC, 9/1/92-2/1/96, role: PI.
13. "U.S.-Korea Joint Research on Hybrid system for Seismic Structures with Resonant Dampers and Robust Mutiobjective Controllers," $305,760, National Science Foundation/MRTC, 8/15/93-2/14/96, Role: Co-PI, (with Drs. F. Cheng and V. Rao)
14. "Graduate Research Traineeships in Machine Tool Research," $695,000, National Science Foundation, 10/1/93-3/31/99, Role: Co-PI, (with Drs. B. Armaly, A. Okafor, K. Krishnamurthy, and W. Lu)
15. "Real Time Dynamic Simulation and Display of Mechanical Assemblies," $70,000, Software Systems Specialist Inc./MRTC (DoD STTR Program), 10/1/94-9/30/95, role: PI (with Dr. Bruce McMillin).
16. "An Interdisciplinary Design Course that Utilizes Concurrent Engineering Principles Along with Unigraphs," $132,311, McDonnell Douglas Corporation, 6/96-6/98, Role: Co-PI (with B. Selberg, A, Okafor, and H. Wiebe).
17. "Metrology Equipment to Enhance Agile Manufacturing and Automatic Inspection Research and Education at UMR", Brown and Sharpe/UMR, $62,000, 8/96-7/97, role: PI (with Allada, V., Krishnamurthy, K., Lu, W., Mitchell, O. R., Moss, R., Rao, V.)
18. "Automation Of Wiring Harness Assembly Process", NIST/Mid-Am. Mfg. Tech. Ctr. (MAYTAG Inc./ MRTC/UMR), $43,698, 1/97-8/97, role: PI.
19. "Contact Analysis Between Mechanical Components", UM Research Board, $29,646, 7/97-8/98, role: PI.
20. "Development of a Five-Axis Rapid Metal Forming System," NSF/MRTC/UMR, $670,846, 9/98-8/03, DDM 9871185, role: PI (with Allada, V., Krishnamurthy, K., Lu, W., Mitchell, R. Peaslee, K. and Tsai, H.L.)
21. "Development of An Advanced Rapid Prototyping System," UM Research Board, $100,000, 10/98-9/99, role: PI (with Allada, V., Krishnamurthy, K., Lu, W., Mitchell, R. Peaslee, K. and Tsai, H.L.)
22. “Development of a Virtual and Augmented Reality System for Research in Intelligent Design and Manufacturing,” NSF, 9/1/2000-8/31/2003, $431,401, role: Co-PI (with Agarwal, S., Allada, Fu, Y., Hall, R., V., Kellogg, R., Krishnamurthy, Leu, M., Liu, F., Midha, A., Mitchell, R., and Wunsch, D.
23. “Precision Rapid Metal Forming,” NSF, $10,000, role: PI, July 1, 2000-June 30, 2001.
24. “Doctoral Research and Training in Virtual and Rapid Prototyping,” Leu, M. C., Choi, J., Liou (Co-PI), F., Landers, R., McAdams, D., Midha, A., Tsai, H. L., Okafor, A., U.S. Department of Education, $346,284, July 1, 2001 – June 30, 2004.
25. "Development of a Product Focused Manufacturing Program," awarded by the Society of Manufacturing Engineers Education Foundation, $182,000, 2001-2003, role: PI, (Co-PI: A. Agarwal, V. Allada, M.C. Leu, R. S. Mishra, A. C. Okafor).
26. “Design And Development Of Refractive Devices For Directing Laser Beams,” Leu, M. C., Liou, F. (Co-PI), McAdams, MetaStable Instruments Inc., $30,000, 2001-2002.
27. "Development of a Five-Axis Rapid Metal Forming System," NSF, $12,000, 7/01-6/02, role: PI (with Allada, V., Krishnamurthy, K., Lu, W., Mitchell, R. Peaslee, K. and Tsai, H.L.)
28. ”FORD – UMR Partnership for Lean Thinking in Manufacturing” role: PI (with Venkat Allada and Can Saygin), $355,745, Aug 2001-July 2006.
29. “Gateway to Manufacturing Excellence Project,” NSF, $672,880, 7/2002-7/2005, Ashok Agrawal, Tarrence Freeman, Dale Gerstenecker, Ming Leu, Frank Liou (Co-PI), Venkata Allada, John Clendenin, William Frizelle, Andrew Taylor, and Barton Weihl.
30. “Laser-Based Manufacturing and Materials Processing” U.S. Army, $900,000, 4/2003-9/2004. J. Choi, G. Hilmas, F. Liou (Co-PI), H. Tsai, D. Van Aken.
31. “Development of A Parallel Machine Tool For Research And Education In Advanced Manufacturing,” NSF/RB/UMR, $271,058, 8/2003-8/2005, Landers, Robert G.; Acar, Levent; Balakrishnan, S. N.; Hilgers, Michael Gene; McMillin, Bruce M.; Liou, Frank (role: Co-PI) ; Leu, Ming C.; Saygin, Can.
32. “Die Repair Using Direct Metal Deposition Process,” Spartan Light Metal Products Inc./UMR, $59,981, 2/2004-2/2005, role: PI.
33. “Hybrid Deposition and Removal of Metals for Aerospace Systems,” Air Force Research Laboratory (Contract# FA8650-04-C-5704), role: PI, with Joohyun Choi and Joseph Newkirk, $802,644, 4/2004-4/2007.
34. “CAMT Task 11.1 Program Integration and Oversight,” Leu, Landers, Summers, Liou (role: Co-PI), Tsai, Mishra, O'Keefe, Zoughi, Chandrashekhara, Pommerenke, $380,000, AFRL, 4/2004-4/2006.
35. “Die Repair Using Direct Metal Deposition Process Phase II,” Spartan Light Metal Products Inc./UMR, $34,000, 5/2005-10/2006, role: PI.
36. “2006 NSF Design, Service and Manufacturing Grantees and Research Conference,” $304,258, NSF, role: Co-PI, 01/01/05-12/31/06.
37. “Laser Applications in Fuel Cell Manufacturing,” Department of Transportation, role: PI, $ 29,603, 9/2006-9/2007.
38. “Hybrid Deposition and Removal Process for Aerospace Parts with Complex Geometry,” Air Force Research Laboratory, role: PI, with Joseph Newkirk, $170,000, 4/2006-4/2008.
39. “Recrystallization and Microstructure Control of Laser Deposition Using Hybrid Process,” Air Force Research Laboratory, role: PI, with Joseph Newkirk, $95,000, 4/2006-4/2008.
40. “STTR Phase I: A Multi-Axis Planning System (MAPS) for Direct Fabrication Processes,” National Science Foundation/Product Innovation and Engineering LLC, role: PI, $50,000 (IIP-0637796), 1/2007-12/2007.
41. “Direct Metal Deposition of Graded Alloys for A Space Heat Exchanger,” Air Force Research Laboratory/Boeing, $160,000, role: PI,11/2007-4/2010.
42. “Multi-Axis Planning System for Direct Fabrication and Repair of Metals,” Air Force Research Laboratory/Product Innovation and Engineering LLC. $250,000, role: PI, 8/2007-8/2011.
43. “Die Repair Using LAMP Hybrid Process,” Air Force Research Laboratory/Spartan Light Metal Products, Inc., $150,000, role: PI, 11/2008-10/2010.
44. “Laser Cladding of Green Landing Materials,” Air Force Research Laboratory/Boeing, $80,000, role: PI, 5/2008-5/2010.
45. “STTR Phase II: A Multi-Axis Planning System (MAPS) for Direct Fabrication Processes,” National Science Foundation (IIP-0822739)/Product Innovation and Engineering LLC role: PI, $100,000, 7/2008-7/2012.
46. “Advanced Military Installations That Integrate Renewable Energy And Advanced Energy Storage Technologies,” Air Force Research Laboratory, Contract No. FA4819-09-C-0018, $3,450,000, role: Co-PI with Mariesa Crow (PI), Fatih Dogan, and K.B. Lee, K. Chandrashekhara, K., Robert Landers, Ming Leu, Joe Newkirk, etc., 7/2009-7/2012.
47. “Modeling of Novel Laser Cladding of High Temperature Alloys,” Titanova Inc., role: PI, $50,000, 01/18/10-1/17/11.
48. “REU Site: Additive Manufacturing,” National Science Foundation, role: Co-PI, with Robert Landers (PI), Douglas Bristow, Gregory Hilmas, Ming Leu, Joseph Newkirk, and Hong Sheng, NSF EEC 1004839, $400,000, July 15, 2010 – July 14, 2013.
49. “Surface Finishing of Additive Metal Processes,” Boeing, $25,000, role: PI, with Joe Newkirk, Sep 2010-Sep 2011.
50. “SBIR Phase I: A Multi-Axis Repair System (MARS),” National Science Foundation IIP-1046492, role: PI, $50,000, January 1, 2011 – June 30, 2011.
51. “SBIR Phase IB: A Multi-Axis Repair System (MARS),” National Science Foundation, role: PI, $20,000, July 1, 2011 – Dec 31, 2011.
52. “Multiscale and Multiphysics Modeling of Additive Manufacturing of Advanced Materials,” National Aeronautics and Space Administration, Grant Number NNX11AI73A, $659,984, role: PI, with Joe Newkirk, June 2011-June 2014.
53. “Human-Assisted-Manufacturing Model Library,” Boeing (DARPA iFAB), $310,543, role: PI, with Cihan Dagli and Ming Leu, May 2011 to May 2012.
54. “Laser Deposition for Metal Defect Rework,” GKN-Aerospace, $25,000, role: PI, 11/2011-11/2012.
55. “Prediction and Validation of Material Behavior Fabricated from Additive Metal,” Boeing, $40,000, role: PI, with Newkirk, 11/2011-11/2012.
56. “Doctoral Research and Training in Direct Digital Manufacturing,” US Dept. of Education, $408,315, role: Co-PI, (with Landers, Leu, Bristow, Chandrashekhara, Rahaman, and Newkirk), 08-16-2012-8-15-2015.
57. "Technology Development Support for the C2M2L-1 Program - Area 3," $300,000, role: PI, with M. Leu, Boeing Company, January 19 - November 21, 2012.
58. “Comparison of Laser Deposition and Welding for Metal Defect Rework,” GKN-Aerospace, $20,000, role: PI, 11/2012-11/2013.
59. “Direct Metal Deposition of Functionally Gradient Materials,” Boeing, $40,000, role: PI, with Newkirk, 11/2012-11/2013.
60. “Direct Metal Deposition of Functionally Gradient Materials,” Rolls Royce, $40,000, role: PI, with Newkirk, 11/2012-11/2013.
61. “Iterative Process Control for Laser Metal Deposition,” role: Co-PI (with Douglas Bristow (PI) and Robert Landers), NSF CMMI-1301414, $272,875, 6/1/2013 through 5/31/2016.
62. “Fabrication of Advanced Materials for Space Applications,” role: Science PI, with David Riggins and Joe Newkirk (role: Co-PI), NASA Grant NNX13AM99A NSR 475489, $750,000, 9/1/2013 through 8/31/2016.
63. “Doctoral Research and Training in Direct Digital Manufacturing,” US Dept. of Education, $399,798, August 16, 2012 – August 15, 2015 (additional $133,266 in cost sharing from Missouri S&T), role: Co-PI, (with Landers, Leu, Bristow, Chandrashekhara, Rahaman, and Newkirk), 08-16-2012-8-15-2015.
64. “Direct Metal Deposition of IN625 and Ti64 Functionally Gradient Materials,” Boeing, $20,000, role: PI, with Newkirk, 11/2013-11/2014.
65. “Automated Repair of Metal Defect Rework,” GKN-Aerospace, $25,000, role: PI, 11/2013-11/2014.
66. “SBIR Phase I: Practical On-Machine Inspection Equipment (PROMISE) for Metal Deposition Processes,” National Science Foundation IIP-1345240, role: PI, $50,000, January 1, 2014 – Dec. 31, 2014.
67. “SBIR Phase IB: Practical On-Machine Inspection Equipment (PROMISE) for Metal Deposition Processes,” GE Aviation/National Science Foundation IIP-1345240, role: PI, $30,000, July 1, 2014 – Dec. 31, 2014.
68. “Direct Metal Deposition of SS316 and Ti64 Functionally Gradient Materials with Elemental Powders,” Boeing, $40,000, role: PI, with Newkirk, 1/2015-12/2015.
69. “Robotic Repair with Additive and Subtractive Processes,” GKN-Aerospace, $25,000, role: PI, 1/2015-12/2015.
70. “REU Site: Additive Manufacturing,” National Science Foundation, role: Co-PI, with Robert Landers (PI), Douglas Bristow, Gregory Hilmas, Ming Leu, Joseph Newkirk, and Hong Sheng, NSF EEC 1004839, $415,000, April 1, 2015 – March 31, 2018.
71. “Metal Additive Manufacturing Analysis for Missouri S&T,” Honeywell, role: Co-PI, with Ming Leu (PI), Joseph Newkirk, Robert Landers, Douglas Bristow, Ronald OMalley, $ 1,161,804, 07/2015 to 09/2016.
72. “Cybermanufacturing: Cyber-Enabled Additive Manufacturing of Advanced Materials,” National Science Foundation CMMI-1547042, role: PI, with Jagannathan Sarangapani, $ 159,758, 09/2015-12/2017.
73. “Fabrication of Ti – γ-TiAl Functionally Gradient Materials,” Boeing, $40,000, role: PI, with Newkirk, 1/2016-12/2016.
74. “Simulation of a laser wire deposition process for Ti6Al4V components,” GKN-Aerospace, $40,000, role: PI, 1/2016-12/2016.
75. “Evaluation of Die Repair Using Metal Deposition Process,” Toyota, $40,000, role: PI, 1/2016-12/2016.
76. "To Demonstrate Part Height Control During The Laser Metal Deposition (LMD) Process Using A Height Control Sensor," $30,714, EWI/America Makes, role: PI, January 1 - August 31, 2016.
77. “Additive Manufacturing Simulator (AMS),” $50,000, Product Innovation and Engineering /Department of Energy SBIR Phase I (Grant # DE-SC0015207), role: PI, 2/2016-11/2016.
78. "MRI: Development of an Advanced Materials Additive Manufacturing (AM2) System for Research and Education," National Science Foundation CMMI 1625736/ Missouri S&T, $1,258,600, role: PI, (with J. Newkirk, and J. Sarangapani), September 1, 2016 - August 31, 2019.
79. “Onsite Structural Restoration Methods for Aircraft Components,” Navair SBIR Phase I, Contract # N68335-17-C-0009, $79,999, Product Innovation and Engineering, role: PI, 10/2016-4/2017.
80. “Investigation of build strategies for a hybrid manufacturing process,” Boeing, DMG/MORI, GKN, Spirit, $72,000, role: PI, with J. Newkirk,1/2017-12/2017.
81. “Simulation and validation of a laser wire deposition process for Ti6Al4V components,” GKN, $40,000, role: PI, 1/2017-12/2017.
82. “Investigation of automated die repair strategies,” Toyota and Product Innovation and Engineering, $55,000, role: PI, 1/2017-12/2017.
83. “Feasibility Fuel Systems Applications for AM ,” Cummins, $12,000, role: PI, 1/2017-12/2017.
84. “Metal Additive Manufacturing Analysis for Missouri S&T,” Honeywell, role: Co-PI, with Ming Leu (PI), Lianyi Chen, Joseph Newkirk, Robert Landers, Douglas Bristow, Ronald OMalley, $834,845, 10/2016 to 09/2017.
85. “Additive Manufacturing Simulator (AMS),” $200,000, Product Innovation and Engineering /Department of Energy SBIR Phase II (Contract # DE-SC0015207), role: PI, 8/2017-3/2020.
86. “Onsite Structural Restoration Methods for Aircraft Components,” Product Innovation and Engineering /Navair SBIR Phase I Option, $15,000, role: PI, 8/2017-2/2018.
87. “Optimized Build Plate Design Tool for Metal Laser Powder Bed Additive,” Product Innovation and Engineering /Navair STTR Phase I, Contract # N68335-18-C-0460, $50,000, role: PI, 9/2017-3/2019.
88. “Metal Additive Manufacturing Analysis for Missouri S&T,” Honeywell, role: Co-PI, with Ming Leu (PI), Lianyi Chen, Joseph Newkirk, Robert Landers, Douglas Bristow, Ronald OMalley, $813,809, 1/2018 to 08/2018.
89. “Investigation of Build Strategies for a Hybrid Manufacturing Process,” CAMT/Boeing/DMG/MORI, $52,000, role: PI, (with J. Newkirk), 1/18-12/18.
90. “Development of an Automated Die Repair Process,” CAMT/Toyota, $40,000, role: PI, 1/2018-12/2018.
91. “Modeling and Experimental Validation of A Wire Feed Ti64 Deposition Process,” CAMT/GKN, $40,000, role: PI, 1/2018-12/2018.
92. “Precision Machining of Composite Structures,” Product Innovation and Engineering /Navair SBIR Phase I, Contract # N68335-18-C-0460, $25,000, K. Chandrashekhara (PI), Frank Liou (Co-PI), 6/2018-12/2018.
93. “Innovative Processing Techniques for Additive Manufacture of 7000 Series Aluminum Alloy Components,” Product Innovation and Engineering /Navair STTR Phase I, Contract # N68335-18-C-0425, $225,000, role: PI, 6/2018-8/2019.
94. “Optimized Build Plate Design Tool for Metal Laser Powder Bed Additive,” Product Innovation and Engineering /Navair STTR Phase I Option, $50,000, role: PI, 9/2018-3/2019.
95. “Advanced Mechanical Testing (AMT) System for Highly Irradiated Materials,” Product Innovation and Engineering /Department of Energy STTR Phase I, $50,000, role: PI, with Joe Newkirk, 7/2018-4/2019.
96. “AM Residual Stress for Missouri University of Science and Technology for Boeing Research & Technology,” $45,372, PI: Joe Newkirk, Frank Liou (Co-PI), Boeing Research & Technology, 7-25-2018-12-31-2018.
97. “Onsite Structural Restoration Methods for Aircraft Components,” Product Innovation and Engineering /Navair SBIR Phase II, Contract # N6833518C0603, $100,000, role: PI, 8/2018-8/2020.
98. “Metal Additive Manufacturing Analysis for Missouri S&T,” Honeywell, role: Co-PI, with Ming Leu (PI), Lianyi Chen, Joseph Newkirk, Robert Landers, Douglas Bristow, Ronald OMalley, $804,220, 9/2018 to 08/2019.
99. “Investigation of oxidation reduction of Ti64 in hybrid manufacturing processing,” CAMT/Boeing, $40,000, role: PI, 1/2019-12/2019.
100. “Research on DED processing of Cu-Ni FGM structures,” CAMT/Toyota, $40,000, role: PI, 1/2019-12/2019.
101. “Additive Manufacturing Modeling and Experimental Validation,” CAMT/PINE, $40,000, role: PI, 1/2019-12/2019.
102. “Development of a Robotic Wire-Feed Deposition Cell,” CAMT/GKN, $40,000, role: PI, 1/2019-12/2019.
103. “Phase II: Optimized Build Plate Design Tool for Metal Laser Powder Bed Additive,” Product Innovation and Engineering /Navair STTR Phase II (Contract #N6833519C0319), $90,000, role: PI, 4/2019-4/2020.
104. “Doctoral Research and Training in Advanced Manufacturing,” $774,222, DOEdu GAANN Grant number: P200A180061, R. Landers (PI), Frank Liou (Co-PI), K. Chandrashekhara, Lianyi Chen, Xiangyang Dong, Edward Kinzel, Ming Leu, Heng Pan, and Jonghyun Park, Jan. 2019-September 30, 2020.
105. “Phase II: Advanced Mechanical Testing (AMT) System for Highly Irradiated Materials,” Product Innovation and Engineering /Department of Energy STTR Phase II (Contract #DE-SC0018879), $300,000, role: PI, with Joe Newkirk, 8/2019-8/2022.
106. “Fatigue Prediction for Additive Manufactured (AM) Metallic Components,” Product Innovation and Engineering /Navair STTR Phase I, N68936-20-C-0013, $34,394, role: PI, 10/2019-4/2020.
107. “Additive Manufacturing of Inorganic Transparent Materials for Advanced Optics,” Product Innovation and Engineering /Navair STTR Phase I, Contract # N68936-20-C-0015, $24,505, role: PI, 10/2019-2/2021.
108. “NSF ERC Planning Grant: Engineering Research Center for Integrative Manufacturing and Remanufacturing Technologies (iMart) to Spur Rural Development,” Liou, F. (role: PI), Angela Lueking, Ming Leu, Jagannathan Sarangapani, Suzanna Long, Sajal Das, Jonathan Kimball, Joseph Newkirk, Fatih Dogan, Sahra Sedighsarvestani, Heng Pan, NSF EEC 1937128, $100,000, 9/1/2019 to 8/31/2022.
109. “Phase II: Precision Machining of Composite Structures,” Product Innovation and Engineering /Navair SBIR Phase II (Contract # N6833520C0128), $100,000, K. Chandrashekhara (PI), Frank Liou (Co-PI), 12/2019-12/2021.
110. “Phase II: Innovative Processing Techniques for Additive Manufacture of 7000 Series Aluminum Alloy Components,” Product Innovation and Engineering /Navair STTR Phase II, Contract # N6833520C0029, $225,000, role: PI, 1/2020-9/15/2023.
111. “Development of a Robotic Wire-Feed Deposition Cell II,” CAMT/GKN, $52,000, role: PI, 1/2020-12/2020.
112. “Investigation of oxidation reduction of Ti64 in hybrid manufacturing processing II” CAMT/Boeing, $55,000, Frank Liou (role: PI) and Joe Newkirk (co-PI), 1/2020-12/2020.
113. “Development of High Throughput Mechanical Properties Testing,” Frank Liou (role: PI) and J. Newkirk, Funded by Battelle Energy Alliance, LLC/INL/DOE, Contract # 234370, 3/20-9/23, $ 287,876.
114. “MRI: Acquisition of High-Resolution X-Ray Computed Tomography System for Real-Time, In Situ Studies of Various Effects on Microstructure of Materials,” NSF, 0063035 $1,311,996, Role: Co-PI, October 1, 2020 to September 30, 2021.
115. “Rapid Development of Next Generation Ultrahigh Strength and Lightweight Steels for Army Modernization,” Contract # W911NF2020251, Laura Bartlett (PI), Ronald O’Malley, Joseph Newkirk, Frank Liou (Co-PI), Yijia Gu, Jeffrey Smith, Mario Buchely, Julia Medvedeva, K. Chandrashekhara, Army Research Laboratory, $4,629,288, 9/11/2020 to 9/10/2021.
116. “Development of a Robotic Wire-Feed Deposition Cell III,” CAMT/GKN, $40,000, Frank Liou (role: PI), 1/2021-12/2021.
117. “Investigation of oxidation reduction of Ti64 in hybrid manufacturing processing III” CAMT/Boeing, $40,000, Frank Liou (role: PI) and Joe Newkirk (co-PI), 1/2021-12/2021.
118. “Additive Manufacturing of Inorganic Transparent Materials for Advanced Optics,” Product Innovation and Engineering /Navair STTR Phase II (Contract #N6893621C0048), $150,000, role: PI, 8/2021-8/2024.
119. “Doctoral Research and Training in Advanced Manufacturing,” $816,000, DOEdu GAANN Grant number: P200A210100, with Doug Bristow (PI), Frank Liou (co-PI), K. Chandrashekhara, Xiangyang Dong, Ming Leu, and Jonghyun Park, Oct. 2021-September 2024.
120. “Next Generation Titanium for AM,” $111,112, KCNSC (Honeywell), Joe Newkirk (PI) and Frank Liou (Co-PI), 2-8-2022 to 11-30-2022.
121. “Digital Twin R&D for A Wire-Feed Deposition Process,” CAMT/GKN, $40,000, role: PI, 1/2022-12/2022.
122. “Model Validation of Hybrid Directed Energy Deposition” CAMT/Boeing, $40,000, role: PI, 1/2022-12/2022.
123. “Modeling and Process Planning Tool for Hybrid Metal Additive/Subtractive Manufacturing to Control Residual Stress and Reduce Distortion,” Product Innovation and Engineering /Navair STTR Phase II (Contract #N6833524C0215), $150,000, role: PI, 8/2024-8/2026.
124. “Phase IIA: Advanced Mechanical Testing (AMT) System for Highly Irradiated Materials,” Product Innovation and Engineering /Department of Energy STTR Phase IIA (Contract #DE-SC0018879), $400,000, role: PI, with Joe Newkirk, 8/2022-8/2024.
125. “Next Generation Titanium for AM II,” $ 146,856, KCNSC (Honeywell), Joe Newkirk (PI) and Frank Liou (Co-PI), 2-27-2023 to 8-31-2023.
126. “Investigation of U-Mo Monolithic Fuel Interfacial Bond Strengths,” $ 342,160, BATTELLE Energy Alliance LLC, Joe Newkirk (PI) and Frank Liou (Co-PI), 3-22-2023 to 9-15-2023.
127. “Digital Twin R&D for A Wire-Feed Deposition Process II,” CAMT/GKN, $40,000, role: PI, 1/2023-12/2023.
128. “Model Validation of Hybrid Directed Energy Deposition II” CAMT/Boeing, $60,000, role: PI, 1/2023-12/2023.
129. “Weld Assembly of Large Castings,” GE Renewable Energy, $125,000, role: PI, 4/1/2023-6/30/2024.
130. “Rapid Development of Next Generation Ultrahigh Strength and Lightweight Steels for Army Modernization,” Army Research Laboratory, $450,650, Laura Bartlett (PI), Yijia Gu, Ronald O’Malley, Jeffrey Smith, Mario Buchely, Julia Medvedeva, Joseph Newkirk, K. Chandrashekhara, and Frank Liou (Co-PI), 9/2023-9/2024.
131. “Digital Twin R&D for A Wire-Feed Deposition Process III,” CAMT/GKN, $40,000, role: PI, 1/2024-12/2024.
132. “Demonstration of Part Repair on DMG-Mori LASERTEC 4300” CAMT/Boeing, $60,000, role: PI, 1/2024-12/2024.
133. “Advanced Additive Manufacturing of Titanium,” $ 104,096, KCNSC (Honeywell), Joe Newkirk (PI), Praneeth Isanaka, and Frank Liou (Co-PI), 3-15-2024 to 8-31-2024.
134. “Investigation of Hot Isostatic Press Diffusion Bonded Aluminum and U-Mo Monolithic Fuel Interfacial Bond Strengths,” $625,477, Idaho National Lab, Joe Newkirk (PI), Frank Liou (Co-PI), Arezoo Emdadi, and Praneeth Isanaka, 11/07/2024 to 11/30/2026.
135. “Secured Digital Twin for Additive Manufacturing,” PINE/Navy, $77,102, role: PI, 10/2024 to 4/2025.

In Negotiation:

1. “Design, Fabrication, and Repair of Multi-Material Gears for Improved Performance and Reliability of Wind Turbine Systems,” GE-Vernova/DOE, $500,000, role: PI, 10/2024 to 9/2026.
2. “Durable Coating for Wind Turbine Pitch Bearing Produced via Hybrid Manufacturing,” DOE, $2,000,000, role: PI, with Haiming Wen (Co-PI), and Praneeth Isanaka (Co-PI), 2/2025-1/2028.

Development Grants:

* "Analysis and Synthesis of High-Speed Machinery," $19,650, Faculty Development Fund, UMR, 9/1/87-8/31/88.
* "Flexible Assembly," $27,530, Intelligent System Center, UMR, 1/1/88-12/31/88, Role: Co-PI, with K. Krishnamurthy).
* "Ozark County Times Plant Layout Analysis," $500, Small Business Institute, UMR, 6/1/88-8/1/88.
* "Optimal Design of Mechanical Systems," $500, GM Foundation, 6/1/88-8/1/88.
* "Development of an Advisory Expert System for the Design of High-Speed Mechanisms," $940, Faculty Research Grant S&W, UMR, 5/15/89-6/30/89.
* "Experimental Study of Dynamic Systems Using High-Speed Camera and Digital Imaging Techniques," $35,000, Engineering Equipment Fund, Missouri, 1990.
* "Feature-Based Design Research," $912, Faculty Research Grant E&E, UMR, 5/15/90-8/31/90.
* "Feature-Based Design of Modular Fixturing," $5,000, School of Engineering, UMR, 5/15/90-8/31/90.
* "Development of Guidelines for Flexible Robotic Welding Cell," $980, Faculty Research Grant S&W, UMR, 5/15/90-8/31/90.
* "Computer Simulations of Mechanical Assemblies," $4,130, Graduate School, UMR, 5/15/91-6/30/91.
* "Computer-Aided Manufacturing Research," $3,065, Intelligent Systems Center, UMR, 5/15/91-6/30/91.
* "Development of Advanced Packaging Machinery," taper evident band packaging machine valued at $23,000, Benison & Co., LTD, Taiwan, 1992.
* "Course and Curriculum Development Innovation: Enhancing the Design Process Through Interactive Visualization," $5,198, with Bruce McMillin and Sally Prakash, Internal Awareness Committee of the Curriculum Task Force, UMR, 1994.
* “Fixture Design and Simulation for Automatic Sodering Process,” $500, Modine Heat Transfer, MO, 1995.
* “Equipment For A Low Cost Rapid Prototyping System,” $6,900, UMR, 1995.
* “Human-in the Loop: Fuzzy Logic Simulation Algorithm,” $500, John Deere, 1996.
* “Equipment To Setup A Virtual Prototyping System,” $9,800, UMR, with Wen Lu, 1997.
* “Development of A Virtual Manufacturing and Assembly Laboratory,” $34,000, General Motors/UMR, with Wen Lu, 1997.
* “Laser Applications in Fuel Cell Manufacturing,” $ 21,873, UTC Graduate Fellowship Grant, Missouri S&T, 9/2006-08/2007.
* “Fuel Cells Bi-Polar Plate Design and Manufacturing,” $23,448, UTC Graduate Fellowship Grant, Missouri S&T, 12/2010-1/2010.
* Newkirk, J. and Liou, F. “Recrystallization of Titanium Alloys using Laser Deposition,” Technology Acceleration Program (TAP), Office of Technology Transfer and Economic Development, S&T, $18,353, May 1, 2011 – April 30, 2012.

**PATENTS AND INVENTION DISCLOSURE**:

* Wei Li and Frank W. Liou. "Joining Metallurgically Incompatible Metals" U.S. Patents (2018), US20180161931A1, Available at: <http://works.bepress.com/frank-liou/272/>
* Joe Newkirk, Frank Liou, and Romy Francis, “Systems and methods for fabricating a direct metal deposition structure having fully forged structural qualities,” US 8617661 B2 (<http://www.google.com/patents/US8617661>), Dec. 31, 2013.
* Invention disclosure titled, "A Cost-Effective System for Micro and Nanofabrication" November, 2004.
* Provisional patent titled, "Direct Deposit Device and Method For Nanofabrication," (60/725,737) filed by the OTSP on Oct 12, 2005.

**PROFESSIONAL ACTIVITIES:**

* Advisory Committee, Solid Freeform Fabrication Symposium, 2005-present.
* Site review panelist, Served as a site review panelist for an AM engineering research center, funded by Science Foundation of Ireland, Ireland, March 9-11, 2020.
* Delegation member, US-Australia Additive Manufacturing Technical Exchange, Melbourne, Australia, December 3 - 6, 2018.
* Executive Committee, Consortium for Advanced Hybrid Manufacturing Integrating Technologies (CAM-IT), 2017.
* Executive Advisory Committee, ASME Advanced Design & Manufacturing Impact Forum, AM3D, Boston, MA, August 2 - 5, 2015.
* Member, International Advisory Committee, International Forum on Systems and Mechatronics Conference*,* 2013-2015.
* Member, Executive Advisory Committee (EAC), ASME Advanced Design & Manufacturing Impact Forum, 2013-2014.
* Chair*,* International Advisory Committee, 3rd International Forum on Systems and Mechatronics Conference*,* September 6-9, 2010, Singapore.
* Past Chair, ASME Design Automation Conference, 2009-2010.
* Chair, Honors and Awards Technical Subcommittee, ASME Design Automation Conference, 2009.
* Committee Chair, ASME Design Automation Conference, 2008-2009.
* Member, Honors and Awards Technical Subcommittee, ASME Design Automation Conference, 2008.
* Conference Chair, ASME Design Automation Conference, 2007-2008.
* International Advisory Committee Chair, International Forum on Systems and Mechatronics, 2007, December 3-6, 2007, NCKU, Tainan, Taiwan.
* Division Chair, Manufacturing Division, American Society for Engineering Education Conference, 2006-2007.
* Program Chair, ASME Design Automation Conference, 2006-2007.
* Member of Advisory Committee, Solid Freeform Fabrication Symposium, Austin, Texas, 2005-present.
* Special Sessions Chair, ASME Design Automation Conference, 2005-2006.
* Member of Executive Committee, ASME Design Automation Conference, 2005-2010.
* Program Chair, Manufacturing Division, American Society for Engineering Education Conference, 2005-2006.
* President, Midwest Chinese American Science and Technology Association (MCASTA), 2005-2007.
* Associate Program Chair, Manufacturing Division, American Society for Engineering Education Conference, 2004-2005.
* External Examiner to the University Science Malaysia for School of Mechanical Engineering, 2003-2004.
* Program co-Chair, Midwest Chinese American Science and Technology Conference, 2004.
* Assistant Program Chair, Manufacturing Division, American Society for Engineering Education Conference, 2003-2004.
* Section Coordinator, ASME Design Automation Conference, special session, “Rapid Prototyping and Manufacturing, ” 2002, 2003.
* Session Coordinator, Modern Engineering, Midwest Chinese-American Science and Technology Conference, 2002, 2003.
* Membership Chair, Manufacturing Division of the American Society for Engineering Education, 2002-2003.
* Honors and Awards Committee, ASME, Computers in Engineering Conference, 2000-01, and 2001-02.
* International Program Committee, Industrial Virtual Reality Symposium, November 1-2, 1999, University of Illinois at Chicago, Chicago, IL 1999.
* ASME 23rd Mechanisms Conference Arrangement Committee, 1994.
* Member of the Governing Board SAE St. Louis Chapter, 1989-1994.

Session Chaired/Co-Chaired:

* F. Liou, Chair a session on “Applications: Residual Stress,” at the 35th Solid Freeform Fabrication Symposium, Austin, Texas, August 11-14, 2024.
* F. Liou, Chair a session on “Process Development: Powder Bed Fusion II,” at the 35th Solid Freeform Fabrication Symposium, Austin, Texas, August 11-14, 2024.
* F. Liou, Chair a session on “Process Development: Directed Energy Deposition and Cold Spray,” at the 34th Solid Freeform Fabrication Symposium, Austin, Texas, August 13-16, 2023.
* F. Liou, Chair a session on “Materials: Metals - Copper and Other
* Metals,” at the 33th Solid Freeform Fabrication Symposium, Austin, Texas, July 25-27, 2022.
* F. Liou, Chair a session on “Materials -- Metals I - High Entropy Materials,” at the 32nd Solid Freeform Fabrication Symposium, Austin, Texas, Auguast 2-4, 2021.
* F. Liou, Chair a session on “Hybrid AM Processes,” at the 31st Solid Freeform Fabrication Symposium, Austin, Texas, Auguast 2-4, 2020.
* F. Liou, Chair a session on “Hybrid AM Processes,” at the 30th Solid Freeform Fabrication Symposium, Austin, Texas, August 12-14, 2019.
* F. Liou, Chair a session on “Hybrid AM Processes 2,” at the 29th Solid Freeform Fabrication Symposium, Austin, Texas, August 13-15, 2018.
* F. Liou, Chair a session on “Hybrid Processes II,” at the 28th Solid Freeform Fabrication Symposium, Austin, Texas, August 6-9, 2017.
* F. Liou, Chair a session on “Materials III: Ti-6Al-4V,” at the 27th Solid Freeform Fabrication Symposium, Austin, Texas, August 8-10, 2016.
* F. Liou, Chair a session on “Materials VII: Copper, Silicon, Nickel,” at the 26th Solid Freeform Fabrication Symposium, Austin, Texas, August 10-12, 2015.
* Chair a session on “Materials I – Lightweight Materials,” at the 25th Solid Freeform Fabrication Symposium, Austin, Texas, August 4, 2014.
* Chair a session on “Aerospace Special Track 1 – Validation Process of Additive Manufactured Parts,” at the ASME Advanced Design and Manufacturing Impact Forum, August 19, 2014, Buffalo, New York.
* Chair a session on “Aerospace Special Track 2 – Applications, Advancements & Reliability Developments,” at the ASME Advanced Design and Manufacturing Impact Forum, August 19, 2014, Buffalo, New York.
* Chaired a Session on “Materials II,” at the 24th Solid Freeform Fabrication Symposium, Austin, Texas, August 12-14, 2013.
* Chaired a panel session on (Panelists: Khershed Cooper, Al Salour, Robert B. Tilove, and A. Galip Ulsoy) on “Cyber-Enabled Manufacturing” at the ASME 2012 International Symposium on Flexible Automation (ISFA2012), June 18-20, 2012, St. Louis, MO, Paper ISFA2012-7124.
* Chaired a Special Session on “Design and Manufacturing Integration, Design for Layered Manufacturing**”** at the ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2010, August 15-18, 2010.
* Chaired a Special Session on “Direct Digital Manufacturing**”** at the ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2010, August 15-18, 2010.
* Chaired a Session on “Process Development**”** at the 21st Solid Freeform Fabrication Symposium, Austin, Texas, August 9-11, 2010.
* Chaired a Special Session on “Direct Digital Manufacturing**”** at the ASME 2009 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2009, August 30-September 2, 2009, San Diego, CA.
* Chaired a Session on “Process Development**”** at the *Twentieth Solid Freeform Fabrication Symposium,* Austin, Texas, August 3-5, 2009.
* Chaired a Special Session on “Direct Digital Manufacturing**”** at the *ASME 2008 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, IDETC/CIE 2008,* August 3-6, 2008, Brooklyn, New York.
* Chaired a Session on “Process Development**”** at the *Eighteenth Solid Freeform Fabrication Symposium,* Austin, Texas, August 6-8, 2007.
* Chaired a Keynote Speech Session on “Sensing Rich Approaches to the Design and Operation of Mechatronic Systems (by Professor Masayoshi Tomizuka)**”** at the *International Forum on Systems and Mechatronics,* December 3-6, 2007*,* Tainan, Taiwan*.*
* Chaired a Session on “Mechatronics in Manufacturing” at the *International Forum on Systems and Mechatronics,* December 3-6, 2007*,* Tainan, Taiwan*.*
* Chaired a Session on “Technologies and material for rapid prototype machine,” at International Conference on Advanced Manufacturing Technology, November 26-30, 2007, Tainan, Taiwan.
* Chaired a Panel Session (Panelists: Mary E. Kinsella, Kevin Slattery, and Brent Stucker) on “Rapid Manufacturing Using Metal Additive Technologies: Applications, Challenges, and Directions**”** at the *2007 International Manufacturing Science And Engineering Conference,* October 15-17, 2007, Atlanta, Georgia.
* Chaired a Special Session on “Direct Digital Manufacturing**”** at the *ASME 2007 International Design Engineering Technical Conferences& Computers and Information in Engineering Conference IDETC/CIE 2007,* September 4-7, 2007, Las Vegas, Nevada*.*
* Chaired a Plenary Session on “Design**”** at the *2007 Seventeenth Solid Freeform Fabrication Symposium,* Austin, Texas, August 6-8, 2007.
* Chaired a Special Session on “Rapid Prototyping/Rapid Manufacturing**”** at the *2006 ASME Design Automation Conference,* Philadelphia, PA from September 11-13, 2006.
* Chaired a Session on “Process Development**”** at the *2006 Seventeenth Solid Freeform Fabrication Symposium,* Austin, Texas, August 14-16, 2006.
* Chaired a Session on “Virtual Reality and Rapid Prototyping**”** at the *2005 ASME Design Automation Conference,* Long Beach, CA, September 25-28, 2005.
* Chaired a Special Session on “Rapid Prototyping/Rapid Manufacturing**”** at the *2004 ASME Design Automation Conference,* Salt Lake City, Utah, September 28-October 2, 2004.
* Chaired a Special Session on “Rapid Prototyping/Rapid Manufacturing**”** at the *2003 ASME Design Automation Conference,* Chicago, Illinois, September 2-6, 2003.
* Chaired a Session on “Modern Engineering**”** at the *2003 the Midwest Chinese American Science and Technology Conference,* October 25, 2003.
* Chaired a Special Session on “Rapid Prototyping/Rapid Manufacturing**”** at the *2002 ASME Design Automation Conference,* Montreal, Canada*,* September 29-Oct. 2, 2002.
* Chaired a session “Design III” *at the ASEE Mid-west Session Conference*, Norman, OK, September 11-13, 2002.
* Co-Chaired a technical session “Modeling II” *at the Thirteenth Annual Solid Freeform Fabrication Symposium*, Austin, TX, August 5-7, 2002.
* Co-Chaired a technical session “CAD/CAM Extension II” *at Industrial Virtual Reality Symposium,* Chicago, IL, November 1999.
* Co-Chaired a technical session “Tolerance Analysis” *at the ASME Design Technical Conference,* Sacramento, CA, September 1997.
* Co-Chaired a technical session at the ASME Mechanisms Conference, Irvine, CA, August 21, 1996.
* Co-Chaired a technical session: "Elasto-Dynamics of Mechanisms," *at the ASME Mechanisms Conference*, Minneapolis, MN, September 12, 1994.
* Co-Chaired technical session "Computer Simulation", *at the ASME Computers in Engineering Conference*, San Diego, California, on August 8-12, 1993.
* Chaired technical session "Expert Systems for Manufacturing / Modeling", *at the Twenty-Second Midwestern Mechanics Conference*, Rolla, Missouri, October 6-9, 1991.
* Chaired technical session "Mechanical Systems/Mechanics", *at the Twenty-Second Midwestern Mechanics Conference*, Rolla, Missouri, October 6-9, 1991.
* Co-Chaired technical session "Dynamics of Flexible Mechanisms," *at 1990 ASME Mechanisms Conference*, Chicago, Illinois, September 16-19, 1990.
* Co-Chaired technical session "Expert Systems," *at First National Applied Mechanisms and Robotics Conference*, November 5-8, 1989, Cincinnati, Ohio.
* Chaired technical session "Dynamics and Control of Flexible Robot Arms," *at First International Applied Mechanical Systems Design Conference*, June 11-14, 1989, Nashville, Tennessee.

Reviewer for Technical Papers and Proposals

* Additive Manufacturing
* Solid Freeform Fabrication Symposium
* International Journal of Production Research
* SME Journal of Manufacturing Systems
* Journal of Vibration, Acoustics, Stress, and Reliability in Design
* Mechanisms and Machine Theory
* Journal of Sound and Vibration
* ASME Journal of Mechanical Design
* ASME Mechanisms Conference
* ASME Design for Manufacturing Conference
* ASME Computer in Engineering Conference
* ASME Design Automation Conference
* Artificial Neural Networks in Engineering
* Research Board, University of Missouri
* National Science Foundation
* Army Research Office
* Department of Energy
* National Nuclear Security Administration
* Flanders Innovation & Entrepreneurship
* Canada Foundation for Innovation
* European Research Council
* Mitacs, Canada
* Etc.

**THESES/DISSERTATION SUPERVISION**: (Major Advisor)

Ph.D. students supervised: 56 (10 in progress)

MS students (thesis) supervised: 63 (1 in progress)

Undergraduate students sponsored: Over 200

**COURSES TAUGHT:**

* Missouri University of Science and Technology: (1987-present)

Undergraduate Level:

* + Machine Design I
  + Automatic Control of Mechanical Systems
  + Linear Systems in Mechanical Engineering
  + Machine Dynamics
  + Analysis and Synthesis in Engineering Design

Graduate Level:

* + Synthesis of Mechanisms
  + Concurrent Engineering I
  + Concurrent Engineering II
  + Rapid Product Design and Optimization
  + Integrated Product Development
  + Manufacturing Automation
  + Advanced Topics in Design and Manufacturing

**COURSES DEVELOPED:**

* ME 5708 Rapid Product Design and Optimization
* ME 5758 Integrated Product Development
* ME 6659 Advanced Topics in Design and Manufacturing

**LABORATORY DEVELOPMENT:**

* Agile Manufacturing and Automatic Inspection Laboratory (AMAIL Lab.), Intelligent Systems Center.
* Laser Aided Manufacturing Processes (LAMP) Laboratory.

**UNIVERSITY SERVICES:**

* Director, Manufacturing Engineering program, Missouri S&T, 1998-present.
* Coordinator, Intelligent Manufacturing Processes, Equipment, and Systems (IMPES) Research Area, Intelligent Systems, 1998-2021.
* Tenure and Promotion Committee, Mechanical and Aerospace Engineering, Missouri S&T, 1999-present.
* Personnel Standing Committee, Faculty Senate, Missouri S&T, 2011-present.
* Tenure and Promotion Committee, Engineering Management and Systems Engineering, Missouri S&T, 2010.
* Tenure and Promotion Committee, Interdisciplinary Engineering, UMR, 2007.
* Tenure and Promotion Committee, Business Administration, UMR, 2007.
* Tenure and Promotion Committee, Mechanical and Aerospace Engineering, UMR, 2007.
* UMR Vice Provost for Academic Affair Search Committee, 2007.
* Chair, Tenure and Promotion Committee, ME, AE, and EM Department, UMR, 2001-2005.
* Chair, Space Allocation Committee, Mechanical and Aerospace Engineering, UMR, 2001-present.
* Graduate Council, S&T, 2001-present.
* Chair, Search Committee, Virtual Manufacturing and Rapid Product Realization Faculty Position, UMR, 1998-99.
* Chair, Executive Committee, Manufacturing Education Program, S&T, 1998-present.
* North Central Association Accreditation Committee, UMR Campus Committee, 1998- 99.
* Manufacturing Processes Emphasis Area Committee, MAE Department, S&T, 1996-Present.
* Chair, Mechanics and Systems Design Technical Committee, ME, AE, and EM Department, 1996-98.
* Curricula, Admissions & Acad. Standards Committee, School of Engineering, UMR, 1997.
* Curriculum Committee, ME, AE, and EM Department, UMR, 1996-98.
* Advisory Committee, ME, AE, and EM Department, 1996-97.
* Co-Coordinator, ISC Open House, UMR, 1996, 1998.
* Coordinator, Intelligent Manufacturing Systems Research Group, Intelligent Systems Center, University of Missouri-Rolla, 1993-present.
* Coordinator, Agile Manufacturing and Automated Inspection Laboratory, Intelligent Systems Center, University of Missouri-Rolla, 1993-2000.
* Laboratory Committee, ME, AE, and EM Department, University of Missouri-Rolla, 1993-1994.
* Manufacturing Education Task Force Committee, University of Missouri-Rolla, 1993.
* Vibration Laboratory Coordinator, ME, AE, & EM Department, University of Missouri-Rolla, taking charge of major equipment such as high-speed camera and digitizing system, HP modal testing set, etc., 1990-1994.
* Faculty Advisor to SAE Formula Car Project, University of Missouri-Rolla, 1989-1991, won the 3rd place out of 52 teams overall in 1990.
* Faculty Advisor to Society of Automotive Engineers, University of Missouri-Rolla, 1989-1994.
* Member of the Governing Board SAE St. Louis Chapter, 1989-1991.
* Faculty Recruitment Committee, ME, AE, and EM Department, University of Missouri-Rolla, 1988-1991.
* Graduate Faculty Member, 1987-present, Missouri S&T
* Design and Manufacturing Committee (Department, 1987-present), Missouri S&T