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MSEC
Manufacturing Science
and Engineering Conference

namrc 46
North American Manufacturing Research Conference

CONFERENCE GUIDE

JUNE 18-22, 2018

Texas A&M University | Hall of Champions
College Station, Texas

TEES
TEXAS A&M ENGINEERING EXPERIMENT STATION

ENGINEERING
TEXAS A&M UNIVERSITY

ASME
SETTING THE STANDARD

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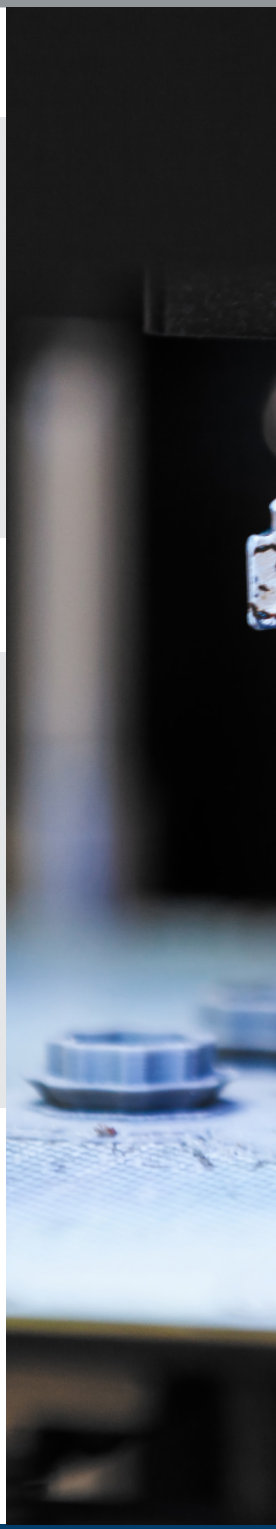

CONFERENCE SCHEDULE

MONDAY, JUNE 18

TIME	LOCATION	EVENT
08:00 - 19:00	Lobby	Registration/Information
09:00 - 15:00	101	NAMRI Board Meeting
11:30 - 17:30	103	NSF Proposal Writing Workshop
14:00 - 16:00	Field Box Concourse	Poster Set-up
14:00 - 16:00	Field Box Concourse	Exhibitor Booth Set-up
17:30 - 19:30	Legacy Club - 4th Floor	Welcome Reception w/ heavy hors d'ouevres

TUESDAY, JUNE 19

TIME	LOCATION	EVENT
07:00 - 19:00	Lobby	Registration/Information
07:00 - 08:00	Field Box Concourse	Poster Set-up
07:00 - 08:00	Field Box Concourse	Exhibitor Booth Set-up
07:00 - 08:00	Legacy Club - 4th Floor	Continental Breakfast
08:00 - 08:20	Main Hall	Welcome - Katherine Banks & Andreas Alcantar
08:20 - 09:00	Main Hall	Keynote - Ahmed Mahmoud
09:00-10:00	Field Box Concourse	Poster Set-up
09:00-10:00	Field Box Concourse	Exhibitor Booth Set-up
09:10 - 10:40		Technical Session 1
09:10 - 10:40	103	Student Manufacturing Design Competition - Session 1
10:00 - 17:00	Field Box Concourse	Exhibitor Booths Open
10:40 - 11:00	Field Box Concourse	Break
11:00 - 12:30		Technical Session 2
11:00 - 12:30	103	Symposium Invited Speaker 1 - Xinhua Wu

12:30 - 13:50	Main Hall	Luncheon Keynote - Mike Molnar
12:30 - 13:50	101	JMSE Editorial Board Meeting
14:00 - 15:30		Technical Session 3
14:00 - 15:30	103	Symposium Invited Speaker 2 - Glenn Daehn
14:00 - 15:30	G103	ASME MED 100 Years Meeting
15:00 - 17:00	Field Box Concourse	Poster Session 1
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 4
15:50 - 17:20	103	Student Manufacturing Design Competition - Session 2
17:30 - 18:15	103	NAMRI Membership Meeting
18:15 - 19:00	103	ASME MED Membership Meeting
19:00 - 21:00	Off Site	Cultural Event - Dinner/Network Social

WEDNESDAY, JUNE 20

TIME	LOCATION	EVENT
07:00 - 18:00	Lobby	Registration/Information
07:00 - 08:00	Legacy Club - 4th Floor	Continental Breakfast
08:00 - 09:00	Main Hall	Keynote - Deborah Wince-Smith
09:10 - 10:40		Technical Session 5
09:10 - 10:40	103	Federal Agencies' Perspectives on Advanced Manufacturing
10:00 - 17:00	Field Box Concourse	Exhibitor Booths Open
10:40 - 11:00	Field Box Concourse	Break
11:00 - 12:30		Technical Session 6
11:00 - 12:30	103	Symposium Invited Speaker 3 - Dong-Woo Cho

CONFERENCE SCHEDULE

11:00 - 12:30	Burkhardt	What's New at NSF – Update from NSF Program Directors
12:30 - 13:50	Main Hall	ASME/MED Awards Luncheon, with a Special Guest – ASME President-Elect Said Jahanmir
12:30 - 13:50	Private Suite - 4th Floor	SME Journal Editorial Board Meeting
14:00 - 15:30		Technical Session 7
14:00 - 15:30	103	Blue Sky Competition - Session 1
14:00 - 17:30	Off Site	Industrial Tour-Daikin (registration required)
15:00 - 17:00	Field Box Concourse	Poster Session 2
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 8
15:50 - 17:20	103	Blue Sky Competition - Session 2
18:00 - 21:00	103	Early Career Forum
	Off Site	Dinner on Your Own

THURSDAY, JUNE 21

TIME	LOCATION	EVENT
07:00 - 18:00	Lobby	Registration/Information
07:00 - 08:00	Legacy Club - 4th Floor	Continental Breakfast
08:00 - 09:00	Main Hall	Keynote - Takeshi Ebisu
09:10 - 10:40		Technical Session 9
09:10 - 10:40	103	RAMP Workshop - Session 1 (NIST Competition Presentations - 1)
10:00 - 17:00	Field Box Concourse	Exhibitor Booths Open
10:40 - 11:00	Field Box Concourse	Break
11:00 - 12:30		Technical Session 10
11:00 - 12:30	103	RAMP Workshop - Session 2 (NIST Competition Presentations - 2, Lightning Talks - 1)

12:00 - 12:30	405	MForesight Presentation - Tom Mahoney
12:30 - 13:50	Main Hall	SME Awards Luncheon & NAMRI Founders Lecture
14:00 - 15:30		Technical Session 11
14:00 - 15:30	103	RAMP Workshop - Session 3 (Lightning Talks - 2, ASTM Schema Refinement)
15:00 - 17:00	Field Box Concourse	Poster Session 3
15:00 - 17:30	Off Site	Lab/Facility Tours A,B,C,D (registration required)
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 12
15:30 - 17:20	103	RAMP Workshop - Session 4 (Brainstorming Future Research Directions)
17:00 - 17:45	Field Box Concourse	Exhibitor Booth Move-out
17:20 - 18:00	Field Box Concourse	RAMP Poster Session & Awards (Best Poster & NIST Competition Winners)
18:00 - 19:30	Main Hall	Conference Banquet

FRIDAY, JUNE 22

TIME	LOCATION	EVENT
07:30 - 13:00	Lobby	Registration/Information
07:30 - 08:30	Legacy Club-4th Fl.	Continental Breakfast
08:40 - 10:10		Technical Session 13
10:10 - 10:30	Field Box Concourse	Break
10:30 - 12:00		Technical Session 14
12:00 - 13:00	Main Hall	Boxed Lunch Pick-up

WELCOME from 2018 MSEC/NAMRC HOSTS

Dear Colleagues,

On behalf of Texas A&M Engineering Experiment Station (TEES) and its Institute for Manufacturing Systems, the organizers of 2018 MSEC/NAMRC extend a warm welcome to all of you. Aggieland, as College Station is affectionately known, has been home to Texas A&M University, which has a long history of research, education and workforce development in manufacturing.

The resurgence of interest in manufacturing as an engine for international development, together with advances in cloud computing and ubiquitous sensors, actuators and controllers, has opened up a unique opportunity to democratize advanced manufacturing across many disciplines that transcend traditional engineering domains. This is an exciting opportunity for the manufacturing community to "think beyond the shopfloor" and reimagine how products can be made, qualified, distributed, and recycled. This is particularly true for the making of custom, high value parts for consumer products, medical, as well as other industrial sectors. Furthermore, the green energy and shale gas revolutions have provided a huge boost to the establishment of new manufacturing industries. The effect of this will be gradually felt throughout the U.S. and the world in the years to come. This conference is in support of this manufacturing renaissance and to anticipate and address its secondary effects.

We would like to thank key staff members Brian Blake, Kelly Gideon, Wendy Herrick, Cecelia Lawley, Julia Pierko, Beth Stanley and Melissa Walden, who have managed all the arrangements for the conference. We also thank the College of Engineering, the engineering department heads and our colleagues in the manufacturing group for their generous support of the conference both in terms of logistics and also making it possible for many students and faculty to attend the conference. We also thank the MSEC and NAMRC conference committees for overseeing the review process that has resulted in this outstanding conference.

We hope you enjoy the hospitality of Aggieland and find the conference useful towards advancing your technical knowledge as well as your network of contacts.

Thank you,

Organizing Committee

Jyhwen Wang, Engineering Technology and Industrial Distribution
Satish Bukkapatnam, Industrial and Systems Engineering
Arun Srinivasa, Mechanical Engineering
Mathew Kuttolamadom, Engineering Technology and Industrial Distribution
Michael Johnson, Engineering Technology and Industrial Distribution
Yu Ding, Industrial and Systems Engineering
Alaa Elwany, Industrial and Systems Engineering
Bruce Tai, Mechanical Engineering
Dean Schneider, Texas A&M Energy Institute

WELCOME from TEXAS A&M UNIVERSITY

Howdy, Conference Attendees!

"Howdy" is the official greeting of Texas A&M University. You may hear this greeting while you are on our campus – it's part of what has helped Texas A&M to earn its reputation as the friendliest campus in the world.

It is my pleasure to welcome you to welcome two premier events, the ASME International Manufacturing Science and Engineering Conference (MSEC) 2018 and the 46th NAMRI/SME North American Manufacturing Research Conference (NAMRC).

As you know, these conferences are the premier international forum on manufacturing research. We are honored to be hosting more than 650 international researchers and manufacturers on the Texas A&M campus and look forward to hearing about the latest innovation and development in manufacturing, cyber-physical systems and materials processing.

In my role as vice chancellor and dean of engineering, I am responsible for the largest college on campus with more than 19,000 students, as well as the Texas A&M Engineering Experiment Station, a global engineering research agency. Our program includes more than 600 outstanding academic faculty and researchers who are addressing some of today's toughest engineering challenges. I hope you can engage with them during the conference and we welcome future academic and research partnerships.

If there is anything we can do to help make this conference more meaningful for you, please do not hesitate to ask.

M. Katherine Banks, Ph.D., P.E.
Vice Chancellor and Dean of Engineering
Director, Texas A&M Engineering Experiment Station
Distinguished Professor
Harold J. Haynes Dean's Chair Professor

WELCOME

On behalf of the Technical Program and Scientific Committees, we welcome you to the joint International Manufacturing Conference consisting of the 13th ASME International Manufacturing Science and Engineering Conference (MSEC 2018), sponsored by the Manufacturing Engineering Division (MED) of ASME and the 46th North American Manufacturing Research Conference (NAMRC 46), sponsored by the North American Manufacturing Research Institution of SME (NAMRI/SME), co-located and hosted by the Texas A&M University, from June 18 to June 22, 2018, in College Station, Texas. As leading world-class societies in the Mechanical and Manufacturing Engineering fields, ASME and SME act as global bridges between industries, government laboratories, and academic institutions. This joint conference symbolizes the continued collaboration between these esteemed organizations in research exchange and knowledge dissemination in the manufacturing fields.

Each of the co-located conferences includes technical sessions covering the full range of manufacturing topics. Every single paper submitted to the conferences was put through a rigorous peer review process. We are in debt to all reviewers for their critical assessment of a very large number of submissions.

MSEC 2018 received over 274 draft papers and 60 poster submissions. After a rigorous peer review process, 245 technical papers and 58 posters were accepted for presentation in over 88 technical sessions. In addition, the conference has 10 industry-sponsored research presentations. The MSEC/NAMRC special panels, 'Federal Agencies' Perspectives on Advanced Manufacturing' and 'What's New at NSF' are featured. This year, MSEC has 32 symposia in 6 Technical Tracks: Additive Manufacturing, Manufacturing Equipment and Systems, Processes, Materials, Bio and Sustainable Manufacturing, and Manufacturing USA. MSEC also features the Symposium-Invited Speakers Program in three emerging areas: Additive Manufacturing, Impulse Joining and Manufacturing, and Biomedical 3D Printing Technology and Applications. The conference also includes three student-centric events: Early Career Forum, Student Manufacturing Design Competition, and the Reusable Abstractions of Manufacturing Processes (RAMP) Competition and Workshop.

NAMRC 46 received over 243 technical paper submissions. Following the review process, 184 papers were accepted for publication in the Proceedings of NAMRI/SME and presentation at the conference in 64 technical sessions. The papers included in the conference address a wide range of basic and applied manufacturing research topics in six tracks: (1) Manufacturing Systems, (2) Manufacturing Processes, (3) Additive Manufacturing, (4) Smart Manufacturing and Cyber-Physical Systems, (5) Manufacturing Education, Workforce Development and Outreach, and (6) Industrial Applications and Manufacturing Implementation. NAMRC 46 continues to feature the second NAMRI/SME David Dornfeld Manufacturing Vision Award and Blue Sky Competition, funded by the National Science Foundation. The winner of the Blue Sky Competition will receive the NAMRI/SME Dornfeld Manufacturing Vision Award, named in honor of the late Professor David Dornfeld,

to recognize outstanding vision and leadership within the manufacturing community. NAMRC 46 will also include a Student Research Presentations Competition.

The conference program is the result of the outstanding efforts of many people. We would like to thank all the authors for their technical paper and poster submissions. We also express our gratitude to all the organizers for their dedicated management of the tracks and symposia, as well as for guarding the quality of the papers and posters to be presented, which has contributed a great deal to the success of the conference technical program. We would also like to thank the Host Organizing Committee, the Conference Coordinating Committee, the NAMRI/SME Scientific Committee, and the ASME MED Executive and Technical Committees. Our thanks also goes to the ASME and SME staff for their outstanding job in presenting conference information on the internet, managing the submitted technical papers and posters, and ensuring high-quality publication of the conference proceedings for MSEC 2018 and NAMRC 46. We would like to extend our gratitude to all sponsors for providing financial support. Additionally, we would like to thank the Advanced Manufacturing Cluster within the Civil, Mechanical and Manufacturing Innovation (CMMI) Division of the National Science Foundation (NSF) for sponsoring the Early Career Forum, the "Blue Sky" Competition, the NSF Proposal Writing Workshop, and for providing registration and accommodation support for selected student participants from U.S. universities.

We wish you a productive and enjoyable conference experience at Texas A&M in College Station, Texas. We hope that the proceedings are beneficial and we sincerely wish that you have a long-lasting affiliation with the future MSEC and NAMRC.

Arif S. Malik
The University of Texas at Dallas, USA
MSEC 2018 Technical Program Chair

Lihui Wang
KTH Royal Institute of Technology, Sweden
NAMRI/SME Scientific Committee Chair

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MSEC TRACK & SYMPOSIUM ORGANIZERS

Track 1: Additive Manufacturing (Organizer: Yong Huang, University of Florida)
Symposium 1-1: Quality Assurance in Additive Manufacturing Systems: Sensing, Analytics, & Control
Organizers: Prahalad Rao, Olga Wodo, Chi Zhou, William Carter
Symposium 1-2: Advances in Additive Manufacturing Process Design & Part Performance
Organizers: Alessandro Fortunato, Xin Zhao, Alessandro Ascari, Adrian Lutey, Federico Iacovella
Symposium 1-3: Advances in Micro- & Nano-Additive Manufacturing
Organizers: Ping Guo, Yayue Pan, Jae-Won Choi, Majid Minary, Jun Zeng
Symposium 1-4: Advances in 3D Printing of Tissue Scaffolds
Organizers: Scott Collins, Roland Kaunas
Symposium 1-5: Design for Manufacturability for Additive Manufacturing
Organizers: Mohamed Gadalla, Hong Seok Park, Yaoyao Fiona Zhao, Carlos Torres

Track 2: Manufacturing Equipment & Systems (Organizer: Mathew Kuttolamadom, Texas A&M University)
Symposium 2-1: Innovations in Equipment Design, Control & Automation
Organizers: Keith Bourne, Burak Sencer, Hongliang Wang
Symposium 2-2: Advances in Cyber Physical Systems, Stochastic Modeling, & Sensor Networks in Advanced Manufacturing
Organizers: Zhenhua (David) Wu, Prahalada Rao, Vukica Jovanovic, Parikshit Mehta, Mathew Kuttolamadom
Symposium 2-3: Advances in Monitoring, Diagnostics, & Prognostics to Enhance Maintenance & Control Strategies
Organizers: Brian Weiss, Michael P. Brundage, Guoxian Xiao, Boonserm Kulvatunyou, Chandra Nath
Symposium 2-4: Advances in Development, Measurement, & Operations Improvement of Complex Manufacturing Systems for Optimized Throughput
Organizers: Cary Zhang, Herman Tang
Symposium 2-5: Advances in Data Analytics & Engineering Modeling for Intelligent & Resilient Manufacturing Systems
Organizers: Chenhui Shao, Xiaoning Jin, Weihong Guo, Yujie Chen
Symposium 2-6: Intelligent Maintenance Decision Making of Manufacturing Systems
Organizers: Yong Wang, Zeyi Sun, Ruoyu Li
Symposium 2-7: Advances in Information Visualization & Visual Analytics for Product Lifecycle Decision-Making
Organizers: William Bernstein, Devarajan Ramanujan, Sundar Murugappan, Vinayak
Symposium 2-8: Advances in Data Management for the Digital Thread in Manufacturing
Organizers: Thomas Hedberg, Moneer Helu, Dazhong Wu, Parikshit Mehta, Binil Starly, Janis Terpenny
Symposium 2-9: Technologies Development for Cognitive Design-thinking Manufacturing
Organizers: Steve Hsueh-Ming Wang, Chao-Chang Chen, Bruce Tai, Ta-Hsin Chou
Symposium 2-10: Advances in Quality, Reliability, & Continuous Improvement in Manufacturing Development and Executions
Organizers: Herman Tang, George Smith

Track 3: Processes (Organizer: Wayne Cai, General Motors)
Symposium 3-1: Abrasive Machining Processes: Michael P. Hitchiner Memorial Symposium
Organizers: Mark Jackson, Kai Cheng, Hitoshi Ohmori
Symposium 3-2: Advances in Nontraditional Manufacturing Processes
Organizers: Murali Sundaram, Zhigang Wang
Symposium 3-3: Monitoring, Sensing, & Control for Smart Manufacturing
Organizers: Radu Pavel, Samuel Huang
Symposium 3-4: Advances in Assisted / Augmented Manufacturing Processes
Organizers: Durul Ulutan, Farbod Akhavan-Niaki, Andrew Henderson
Symposium 3-5: Advances in Modeling, Analysis, & Simulation of Manufacturing Processes
Organizers: Alireza Shirazi, Zhichao (Charlie) Li, Ihab Ragai
Symposium 3-6: Machining Technologies for Multi-axis & Multi-tasking Manufacturing Processes
Organizers: Takashi Matsumura, Keiichi Shirase, Toshiyuki Muraki, Harumitsu Senda
Symposium 3-7: Advances in Micro & Nano Manufacturing Processes & Systems
Organizers: Martin Byung-Guk Jun, Chandra Nath, Simon Park
Symposium 3-8: Nanomanufacturing Processes
Organizers: Rajiv Malhotra, Bruno Azeredo

Track 4: Materials (Organizer: Gary Cheng, Purdue University)
Symposium 4-1: Advances in Processing of Polymers & Polymer-based Composites
Organizers: Felicia Stan, Ramasubramani Kuduva Raman Thanumoorthy, Fabrizio Quadrini
Symposium 4-2: Novel Joining Technologies for Dissimilar Materials
Organizers: Wayne Cai, Yongbing Li
Symposium 4-3: Machining of Difficult-to-Cut Materials
Organizers: Rahul Chaudhari, Hitomi Yamaguchi, Fukuo Hashimoto
Symposium 4-4: Tribology of Material Removal/Deformation Processes & Machinery
Organizers: Dinakar Sagapuram, Niklaus Rüttimann, Blaser Rachid M'Saoubi, Mathew Kuttolamadom
Symposium 4-5: Advances in the Mechanics of Materials & Manufacturing Processes
Organizers: Christopher Saldana, Rachid M'Saoubi, Dinakar Sagapuram
Symposium 4-6: Advances in Composites Manufacturing Processes
Organizers: Johnson Samuel, Daniel Walczyk, Bryan Chu
Symposium 4-7: Advances in Metal Matrix Nanocomposites
Organizers: Jing Shi, Xiaochun Li, Chao Ma, David Weiss

Track 5: Bio & Sustainable Manufacturing (Organizer: Eda Yildirim-Ayan, University of Toledo)
Symposium 5-1: Advances in Analysis, Design, & Manufacturing of Biomedical Devices
Organizers: Roland Chen, Yancheng Wang, Kuang-Wei Lin
Symposium 5-2: Advancing Biomedicine through Innovative Manufacturing & Materials
Organizers: Daniel Alge, Yiwen Chen, Qing Meng, Ben Wang, Shiren Wang
Symposium 5-3: Advanced Methods for Scalable 3D Tissue Culture & Characterization
Organizers: Stephen Navran, Roland Kaunas, Kevin Francis
Symposium 5-4: Smart Manufacturing & System Sustainability
Organizers: Dazhong Wu, Bingbing Li, Chris Yuan, Shaopeng Liu, Xiaochun Li
Symposium 5-5: Sustainability & the Industrial Internet: How data can lead to improved sustainability
Organizers: Michael P. Brundage, Yang Li, Qing Chang, KC Morris, Jorge Arinez
Symposium 5-6: Sustainable Operations Management in Manufacturing Systems & Processes
Organizers: Wei Li, Kozo Saito, Ken Kreafl
Symposium 5-7: Cloud-based Smart Manufacturing
Organizers: Xun Xu, Xi Vincent Wang, Nenad Ivezic, Yujie Chen

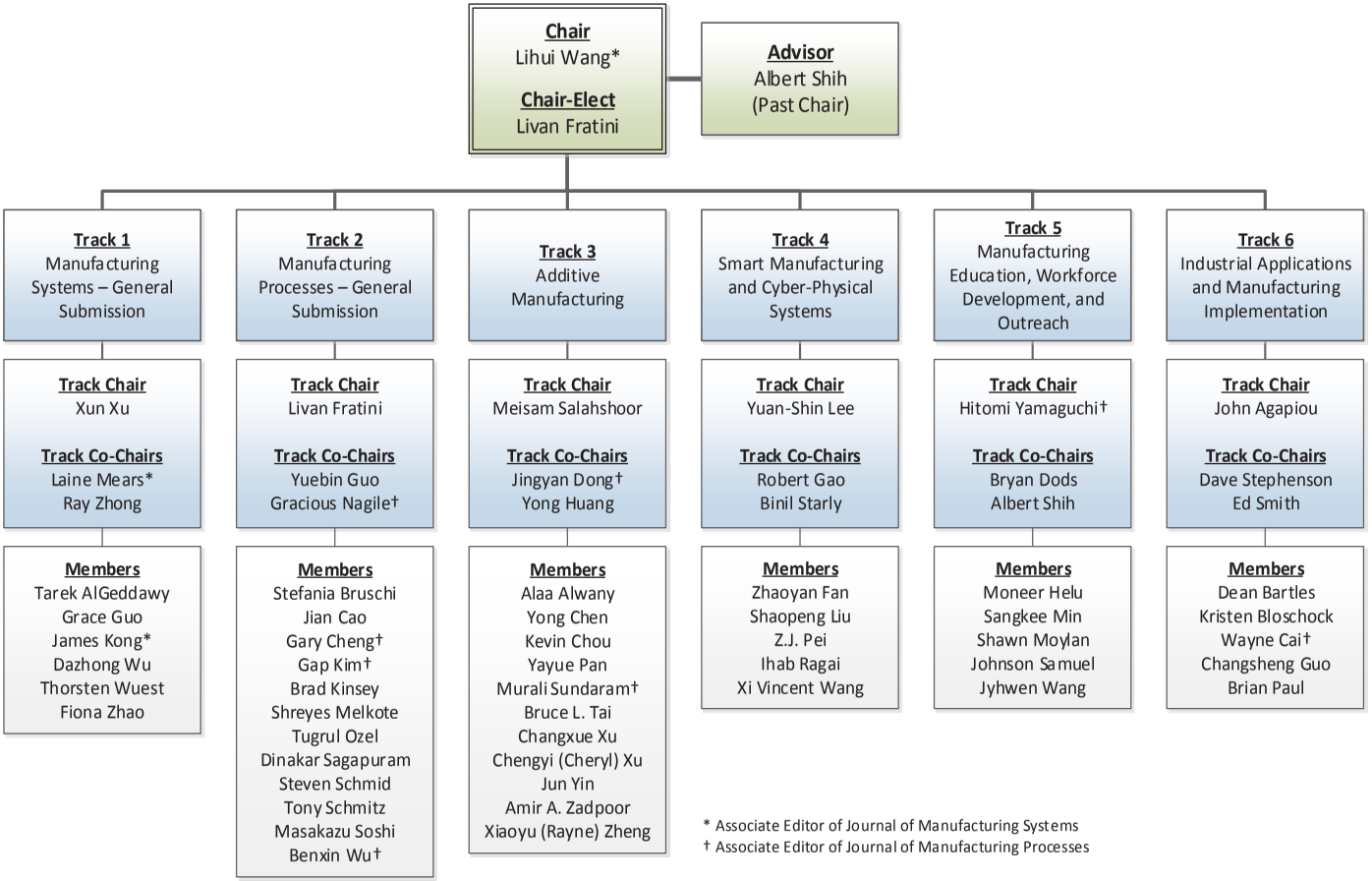
Track 6: Posters (Organizers: Zhijian Pei, Texas A&M University, Arif Malik; University of Texas at Dallas)

Track 7: Joint MSEC-NAMRC-Manufacturing USA (Organizers: Arif Malik, University of Texas at Dallas; Lihui Wang, Kungliga Tekniska Högskolan (KTH))
Symposium 7-1: Research in Collaboration with Manufacturing USA Institutes
Organizers: Frank Pfefferkorn, Shreyes Melkote, Brad Kinsey, Mike Vogler
Symposium 7-2: Manufacturing Education, Workforce Development, & Outreach
Organizers: Hitomi Yamaguchi, Bryan Dods, Albert Shih, Kevin Chou, Arif Malik
Symposium 7-3: Manufacturing Public Policy: Influence R&D Investment
Organizers: Shawn Moylan, Albert Shih

Track 8: Plenary Sessions (Organizer: Arif Malik, University of Texas at Dallas)

Track 9: Student Manufacturing Design Competition (Organizer: Laine Mears, Clemson University)

Track 10: Joint NIST-ASTM-NSF-ASME Reusable Abstractions of Manufacturing Processes (RAMP) Workshop (Organizers: Karl Haapala, Barbara Linke, Fu Zhao, KC Morris, Bill Bernstein)



* Associate Editor of Journal of Manufacturing Systems
† Associate Editor of Journal of Manufacturing Processes

STUDENT TRAVEL AWARD RECIPIENTS

A National Science Foundation grant has provided support to select students from U.S. institutions to attend the collocated 2018 ASME Manufacturing Science and Engineering Conference and the SME 46th North American Manufacturing Research Conference at Texas A&M University. The organizers of MSEC2018/ NAMRC46 thank Frank Pfefferkorn for organizing the selection process and gratefully acknowledge the generous support of the National Science Foundation in providing financial support to the following students to attend the conference:

Amin Abedini, *University of Kentucky*
Saheem Absar, *Clemson University*
AMM Nazmul Ahsan, *North Dakota State University*
Akinjuyigbe Alo, *Texas State University*
Atin Angrish, *North Carolina State University*
Jennifer Bennett, *Northwestern University*
Xiangfan Chen, *Northwestern University*
Bret Curtis, *Missouri University of Science and Technology*
Soheil Daryadel, *University of Texas at Dallas*
Romina Dastoorian, *Western Michigan University*
Obehi Dibua, *University of Texas at Austin*
Houzhu Ding, *Stevens Institute of Technology*
Truong Do, *Michigan State University*
Nick Duong, *Saint Louis University*
Jennifer Elliott, *UCLA*
Yixuan Feng, *Georgia Institute of Technology*
Zhe Gao, *Rutgers, The State University of New Jersey*
Destiny Garcia, *University of California Davis*
Joslyn Garcia, *UCLA*
Ian Garretson, *University of California, Davis*
Michael Gomez, *The University of North Carolina at Charlotte*
Benjamin Graybill, *Texas A&M University*
Md Ahasan Habib, *North Dakota State University*
Yiwei Han, *North Carolina State University*
Yingbin Hu, *Texas Tech University*
Stephanie Hulsey, *Clemson University*
Farhad Imani, *Penn State*
Ashif Iquebal, *Texas A&M University*
Jie Jin, *University of Southern California*
Ariyan Kabir, *University of Southern California*
Yunyi Kang, *Arizona State University*
Zheng Kang, *Purdue University*
Ashutosh Khatri, *Miami University*
Ali Khoshkhoo, *Auburn University*
Roan Kirwin, *Miami University*
Xiangjia Li, *University of Southern California*
Benjamin Lies, *Iowa State University*
Yang Liu, *University of Michigan*
Ziye Liu, *The University of Alabama*
Michael Locke, *University of New Hampshire*
Jack Lombardi, *Binghamton University*
Lu Lu, *The University of Illinois at Chicago*
Jingxuan Lyu, *University of Michigan*
Le Ma, *Missouri University of Science and Technology*
Shahrima Maharubin, *Texas Tech University*
Kerstern Malama, *California State University Northridge*
Huachao Mao, *University of Southern California*
Mukhtar Maulimov, *Oregon State University*
John Miers, *Georgia Institute of Technology*
Benjamin Mitchell, *University of New Hampshire*
Mohammad Montazeri, *University of Nebraska-Lincoln*
Sudhanshu Nahata, *Carnegie Mellon University*
James Nowak, *Rensselaer Polytechnic Institute*
Rishi Pahuja, *University of Washington*
Shravan Patel, *University of Texas at Dallas*
Laxmi Poudel, *University of Arkansas*
Maxwell Praniewicz, *Georgia Institute of Technology*
Md Fashiar Rahman, *The University of Texas at El Paso*
Roozbeh (Ross) Salary, *State University of New York at Binghamton*
Jennifer Shaffer, *Clemson University*
Yi Shi, *Northwestern University*
Subin Shrestha, *University of Louisville*
Jamie Skovron, *Clemson University*
Mingman Sun, *Kansas State University*
Wenjin Tao, *Missouri University of Science and Technology*
Michael Thornbury, *UCLA*
Ricardo Toro, *University of Illinois at Urbana-Champaign*
Cunfu Wang, *University of Wisconsin-Madison*
Hui Wang, *Texas Tech University*
Yachao Wang, *University of Cincinnati*
Zimo Wang, *Texas A&M University*
Mingtao Wu, *Syracuse University*
Pei-Ying Wu, *University of Florida*
Che-Hao Yang, *Washington State University*
Yang Yang, *Kansas State University*
Bing Yao, *The Pennsylvania State University*
Haoliang Yu, *The University of Texas at Dallas*
Zhicheng Zhu, *Lamar University*
Jing Zou, *Stony Brook University*

MONDAY, JUNE 18, 2018

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NSF Proposal Writing Workshop

Monday, June 18th | 11:30 - 17:30 (break from 15:30 - 15:50)

Organizers: George Hazelrigg, Zhijian (ZJ) Pei, and Tony Schimtz

This workshop will assist attendees in their development of NSF proposal writing skills with a focus on proper framing of research projects. Lack of proper project framing and clearly stated research objectives is a key weakness in a significant fraction of proposals submitted to NSF. Attendees will learn the difference between research goals and research objectives, and four ways to state a research objective. They will also learn how to write the project summary in a way that maximizes the likelihood of success in the review process.

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11:00 - 12:30		Technical Session 2
11:00 - 12:30	103	Symposium Invited Speaker 1 - Xinhua Wu
12:30 - 13:50	Main Hall	Luncheon Keynote - Mike Molnar
12:30 - 13:50	101	JMSE Editorial Board Meeting
14:00 - 15:30		Technical Session 3
14:00 - 15:30	103	Symposium Invited Speaker 2 - Glenn Daehn
14:00 - 15:30	G103	ASME MED 100 Years Meeting
15:00 - 17:00	Field Box Concourse	Poster Session 1
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 4
15:50 - 17:20	103	Student Manufacturing Design Competition - Session 2
17:30 - 18:15	103	NAMRI Membership Meeting
18:15 - 19:00	103	ASME MED Membership Meeting
19:00 - 21:00	Off Site	Cultural Event - Dinner/Network Social

WELCOME SPEAKER

Dr. M. Katherine Banks

Vice Chancellor and Dean of Engineering
Director, Texas A&M Engineering Experiment Station
University Distinguished Professor
Harold J. Haynes Dean's Chair Professor

Dr. M. Katherine Banks is the vice chancellor for engineering for The Texas A&M University System and dean at the Texas A&M University College of Engineering.

As vice chancellor, Banks oversees coordination and collaboration among the engineering, academic and research programs at seven universities throughout the A&M System, as well as three state agencies: the Texas A&M Engineering Experiment Station (TEES), the Texas A&M Engineering Extension Service (TEEX) and the Texas A&M Transportation Institute (TTI). Banks is also TEES director, overseeing research administration of more than 4,800 projects and $208 million in sponsored research awards.

As dean of the College of Engineering, University Distinguished Professor and holder of the Harold J. Haynes Dean's Chair in Engineering, Banks leads one of the largest engineering schools in the country, with more than 16,900 students and 500 faculty. Dr. Banks initiated the 25 by 25 program, a controlled enrollment growth program with a goal of 25,000 engineering students by 2025.

Banks was previously the Bowen Engineering Head for the School of Civil Engineering at Purdue University and the Jack and Kay Hockema Professor at Purdue. She received her B.S.E. from the University of Florida, M.S.E. from the University of North Carolina, and Ph.D. in civil and environmental engineering from Duke University.

Banks is a member of the National Academy of Engineering and Fellow of the American Society of Civil Engineers. She has received numerous awards including the ASCE Petersen Outstanding Woman of the Year Award, ASCE Rudolph Hering Medal, Purdue Faculty Scholar Award, Sloan Foundation Mentoring Fellowship and the American Association of University Women Fellowship.

WELCOME SPEAKER

The Honorable Andres Alcantar

Chairman and Commissioner Representing the Public Texas Workforce Commission

Andres Alcantar is Chairman and Commissioner Representing the Public of the Texas Workforce Commission (TWC). TWC's mission is to promote and support a workforce system that creates value and offers employers, individuals, and communities the opportunity to achieve and sustain economic prosperity.

Chairman Alcantar works to implement customized services to meet the needs of Texas' vast array of industries and advance the development of a strong and competitive workforce. He promotes the expansion of industry-based partnerships that center on best practices to help workers and businesses achieve success. He encourages strategies that prepare students for postsecondary success at work or in the classroom, focusing on science, technology, engineering, and math (STEM) initiatives as a key component of future workforce competitiveness.

KEYNOTE SPEAKER

Ahmed Mahmoud

Chief Information Officer, General Motors IT

Ahmed Mahmoud, CIO, Global Manufacturing, Global Purchasing and Supply Chain (GPSC), Customer Care and Aftersales and Quality, is responsible for transforming the organization into a highly insourced team with a focus on innovation to drive value into GM. He also serves as GM's Executive Champion for Texas A&M University.

Mahmoud is a proven change agent at the senior executive level, with an innate talent for attracting high-performance management teams. He has more than 25 years leading teams in enterprise level information technology (IT). Prior to joining General Motors in 2012, he served as Senior Vice President of Hewlett-Packard's hp.com, e-commerce and marketing organizations. Prior to HP, Mahmoud was Senior Vice President and Chief Information Officer of AMD, where he was responsible for managing the company's global technology strategy, assets and infrastructure to best meet internal needs and serve AMD's customers. Mahmoud spent many years at Dell Inc. where he served as Vice President of IT in Supply Chain, Manufacturing eCommerce and other roles. He also held various IT leadership positions at Eastman Kodak Company.

Ahmed Mahmoud is a recognized IT industry leader. He was named to Computerworld's Premier 100 IT leaders in 2009, and has spoken at the Aspen Institute, among other conferences. He also is a Senior Service College Fellow at The University of Texas, a UT McCombs School of Business VIP speaker. For his alma mater Texas A&M, he serves as the 2017-2018 Vice Chair for the College of Science External Advisory & Development Council Board and has begun a two-year term on Texas A&M Engineering Experiment Station (TEES) advisory board. He earned both a bachelor's and master's degree in physics from Texas A&M University, and lives in Austin, Texas.

Metallurgical Issues and Quality Control in Selective Laser Melting of Aerospace Materials

Tuesday, June 19th | 11:00 - 12:30 | Room 103

Professor Xinhua Wu

Director for Monash Centre for Additive Manufacturing (MCAM)
Monash University, Melbourne, Australia

Abstract

Selective Laser Melting (SLM), also called 3D printing, is being considered for aerospace and biomedical applications where properties, quality control and cost are critical. This presentation highlights the SLM research activities in Monash Centre for Additive Manufacturing, in particular on process optimisation and post heat treatment development in order to achieve required mechanical properties for Ti, Ni and Al alloys. Different materials have different issues in the SLM process, due to their metallurgical and crystallographic differences. Whilst elimination of cracking and retaining high temperature properties and stability are critical for SLM Ni alloys, optimisation of post heat treatment becomes more significant for Al alloys as defined by the nature of the sensitive response of precipitates of Al alloys during heat treatment. The optimum post heat treatment of SLM'd Ti64 has found to be totally associated with the completion of martensitic transformation where ductility of 18% and yield strength of > 900MPa can be easily achieved. Extensive study has been carried out in understanding the evolution of microstructure during solidification and post heat treatment and their influence on tensile and fatigue properties. Aerospace application requires controlling the quality from powder to SLM'd products as is demonstrated here using Ti64 alloy. To achieve equivalence to current international aerospace standards for wrought products, 9 batches of powder atomised from 3 lots of Ti bars, each lot weighing >3 tonnes, were used to make SLM samples using a laser powder bed system. More than 3000 SLM samples have been tested. It has been found that using appropriate quality of barstock followed by rigorous control of the atomisation and SLM processes, outstanding mechanical properties coupled with consistency and repeatability have been obtained in SLM'd Ti64 parts and this has led to the qualification of Ti64 powder and SLM'd parts for civil aerospace applications.

About Professor Xinhua Wu

Professor Xinhua Wu is the founder Director of Monash Centre for Additive Manufacturing and Director for Australia Research Council's Industrial Transformation Research Hub for high value manufacturing. She is a Fellow of Australia Technology, Science and Engineering(ATSE) and IoM3, UK. She is specialised in Ti alloys and in advanced powder processing, in particular 3D printing of metals. Prof. Wu has been actively involved in the research and design of alloys and manufacturing processes for aerospace and biomedical industries. Her research ranges from fundamental material sciences to their implementation in engineering components, from design to manufacturing, from laboratory demonstration to qualification and field testing. Some of her team's products are now flying in aeroengines, aircrafts or implanted in human body. Most notably her team produced the world 1st 3D printed jet engine in 2014. Prof. Wu has published over 130 journal papers, over 40 of them on additive manufacturing, holds 15 international patents, and has given over 30 keynote and invited lectures at leading international conferences, and organised 5 international conferences, and edited 3 conference proceedings. Prof Wu was awarded in 2008 the Ti award by IoM3, UK, for her outstanding record of world-class research in titanium and its alloys. In 2014 she received the top Innovation Award and Jury committee award from global aerospace giant Safran due to numerous SLMed engine parts passed engine tests. She and her industrial partners are also the recipient of Australia's 2016 Best Research Translation Award B/HERT (Business/ High Education Round Table) Award.

The Missing Middle

Tuesday, June 19th | 12:30 - 13:50 | Main Hall

Mike Molnar

Director - Advanced Manufacturing National Program Office
National Institute of Standards and Technology

Abstract

A key challenge to restoring U.S. leadership in advanced manufacturing is addressing the so-called "missing middle" – the technical and business barriers of scaling-up (and speeding up) an innovative new material, process, or technology for robust production use. The Manufacturing USA program is now in its fourth year with 14 innovation institutes. Each institute is a federally sponsored public-private partnership designed to accelerate U.S. innovation through applied research and advanced workforce skills development. These manufacturing institutes are places where industry and academia partner on industry-relevant challenges. This general session provides an overview of the program, highlights from the past year, and developments ahead. For more information see ManufacturingUSA.com.

About Mike Molnar

Mike Molnar is the founding director of the Advanced Manufacturing National Program Office at the National Institute of Standards and Technology, an interagency team which serves as the Congressionally designated program office for Manufacturing USA. Prior to joining NIST in 2011 Mike had a nearly 30-year industry career in advanced manufacturing, with leadership roles in technology development, manufacturing engineering, capital planning, metrology, quality systems, robotics and flexible automation, and computer integrated manufacturing systems. Mike has been active in engineering professional societies, holding over 70 elected or appointed leadership positions – including President of the Society of Manufacturing Engineers and now Governor of the American Society of Mechanical Engineers.

Impulse Joining & Manufacturing: Methods and Opportunities

Tuesday, June 19th | 14:00 - 15:30 | Room 103

Professor Glenn S. Daehn

Mars G. Fontana Professor of Metallurgical Engineering,
Department of Materials Science and Engineering
The Ohio State University

Abstract

Explosive-like impulse can do remarkable things. Impact welding, for example can produce very strong welds between wildly dissimilar metals in a solid-state process, avoiding the intermetallic compounds that often cause brittleness. Explosive forming can dramatically extend forming limits and can avoid presses and fixed dies. This presentation will discuss many ways that explosive-like methods can be used in conventional lab or factory environments. Methods to be considered include:

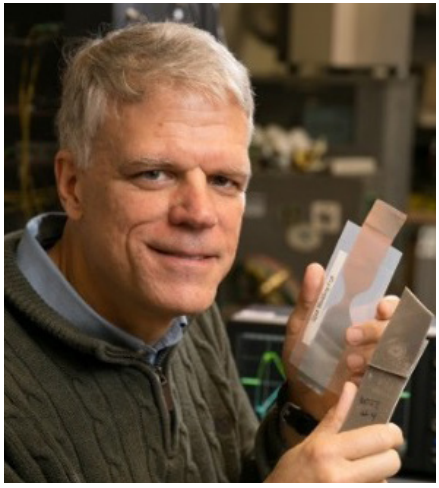
- Chemical Explosives
- Vaporizing metal foils or filaments
- High speed presses
- Electromagnetic Lorentz interaction
- Laser Impulse

While these methods can offer vastly different pressure-time profiles with pressures ranging to GPa and time scales to tens of nanoseconds, all these methods offer opportunities very light equipment and enable new phenomena that can enable new methods of joining, forming, cutting and surface treatment. The operations discussed will include:

- Solid State Impact Welding
- Forming
- Surface Hardening
- Conformal Joining
- Shearing
- Powder Consolidation

We will provide a holistic picture of impact welding synthesizing simulations, instrumented experiments and joined metallic pairs (including high strength steel and aluminum). This will demonstrate that we are verging on clear design methods for impact welding that

considers all important aspects from equipment design to component performance. This will be applied to the prototype manufacturing of advanced automotive components including a multi-material engine cradle. Beyond welding, these methods can be used for effective 'joining by forming' and modifying and reducing residual stress. Guidelines on process capabilities and selection will be provided and opportunities for further research will be discussed.



About Professor Glenn S. Daehn

Glenn S. Daehn is The Mars G. Fontana Professor of Metallurgical Engineering in the Department of Materials Science and Engineering at The Ohio State University. He works in several areas including process innovation and K-12 STEM professional development; providing materials science content and training. His formal training includes a PhD in Materials Science and Engineering from Stanford University and a B.S. from Northwestern University. Most of his current process innovation work is in developing impulse-based manufacturing processes for the joining, shaping and cutting of material. Details are available at http://iml.osu.edu. Prof. Daehn is also active in many manufacturing initiatives, having a hand in founding the LIFT Manufacturing USA institute, Ohio State's Center for Design and Manufacturing Excellence and Ohio Manufacturing Institute. He also serves on the Executive Committee for MForesight and is Vice Chair of the ASM Materials Education Foundation.

MSEC TECHNICAL SESSIONS

0910-1040 401	**Session 1-1-1 - Quality Assurance in Additive Manufacturing Systems: Process Modeling** ***Session Chair: Prahalada Rao | Session Co-Chair: Chi Zhou, Jarred Heigel***	
MSEC2018-6440	Hong Seok Park, Tran Ngoc Hien, Md Jonaet Ansari	Prediction of Temperature Distribution and Residual Stress in SLM Printed Parts
MSEC2018-6644	Subin Shrestha, Kevin Chou	Mesoscopic Simulation Model to Predict Temperature Distribution and Melt Pool Size during Selective Laser Scanning
MSEC2018-6587	Jie Zhao, Yong-Xiang Hu, Zhenqiang Yao	Laser Induced Forward Transfer: Topography Dependence of Laser Fluence and Thickness for Titanium Film
0910-1040 403	**Session 2-1-1 - Robotic Machining - I** ***Session Chair: Burak Sencer | Session Co-Chair: Kai Guo***	
MSEC2018-6659	Yalun Wen, Prabhakar R. Pagilla	Robotic Surface Finishing of Curved Surfaces: Real-Time Identification of Surface Profile and Control
MSEC2018-6689	Shuyang Chen, Yuan-Chi Peng, John Wason, Jinda Cui, Glenn Saunders, Shridhar Nath, John Wen	Software Framework for Robot-Assisted Large Structure Assembly
MSEC2018-6672	Jacob Beck, Burak Sencer, Ravi Balasubramanian, Jordan Meader	Design of a Flexure-Based Active Fixture System for Precision Robotic Deburring
0910-1040 405	**Session 2-2-1 - Advances in Cyber Physical Systems, Stochastic Modeling, and Sensor Networks in Advanced Manufacturing - I** ***Session Chair: Mathew A. Kuttolamadom | Session Co-Chair: Vukica Jovanovic***	
MSEC2018-6460	Saideep Nannapaneni, Sankaran Mahadevan, Abhishek Dubey	Real-Time Control of Cyber-Physical Manufacturing Process under Uncertainty
MSEC2018-6658	Parikshit Mehta, Prahalada Rao, Zhenhua (David) Wu, Vukica Jovanovic, Olga Wodo, Mathew A. Kuttolamadom	Smart Manufacturing: A State-Of-The-Art Review In Context Of Conventional And Modern Manufacturing Process Modeling, Monitoring And Control
MSEC2018-6726	Bhaskar Botcha, Zimo Wang, Sudarshan Rajan, Natarajan Gautam, Satish Bukkapatnam, Prakashan Korambath, Scott S. Miller, Amit Manthanwar, Dean Schneider	Implementing the Transformation of Discrete Part Manufacturing Systems Into Smart Manufacturing Platforms

0910-1040 407	**Session 2-5-1 - Advances in Data Analytics and Engineering Modeling for Intelligent & Resilient Manufacturing Systems - I** *Session Chair: Weihong Guo | Session Co-Chair: Pil-Ho Lee*	
MSEC2018-6507	Zhe Gao, Weihong Guo, Jingjing Li	Sensor Fusion and On-Line Monitoring of Friction Stir Blind Riveting for Lightweight Materials Manufacturing
MSEC2018-6544	Pil-Ho Lee, Yuhang Yang, Haseung Chung, Chenhui Shao, Patrick Kwon, Patrick Steven McCormick, Hoa Nguyen	Experimental and statistical study on magnetic-field assisted finishing of mold steel using nano-scale solid lubricant
MSEC2018-6602	Yuhang Yang, Y. Dora Cai, Qiyue Lu, Yifang Zhang, Seid Koric, Chenhui Shao	High-Performance Computing Based Big Data Analytics for Smart Manufacturing
0910-1040 G101	**Session 3-5-1 - Machining - I** *Session Chair: Sagil James | Session Co-Chair: Xueping Zhang*	
MSEC2018-6327	Shun Liu, Sun Jin, Xueping Zhang, Changhui Liu, Fuyong Yang, Jiamin Chen	Coupled Predicting Surface Variation by Face Milling of Engine Block/Head
MSEC2018-6473	Han Wu, Jianfeng Ma, Shuting Lei	Numerical investigation of dislocation density and grain size evolution in orthogonal cutting of pure titanium using microgrooved cutting tools
MSEC2018-6466	John Miers, Tommy Tucker, Thomas Kurfess, Christopher Saldana	Modeling of Tool-Workpiece Interaction in a Voxelized Framework
0910-1040 G103	**Session 4-2-1 - Thermally Assisted Spot Joining Processes** *Session Chair: Wayne Cai | Session Co-Chair: Yongbing Li*	
MSEC2018-6683	Wayne Cai, Glenn Daehn, Anupam Vivek, Jingjing Li, Haris Khan, Rajiv Mishra, Mageshwari Komarasamy	A State-Of-The-Art Review On Solid-State Metal Joining
MSEC2018-6328	Ying Luo, Haseung Chung, Wayne Cai, Teresa Rinker, S. Jack Hu, Elijah Kannatey-Asibu, Jeffrey Abell	Joint formation in multi-layered ultrasonic welding of Ni-coated Cu and the effect of preheating
MSEC2018-6367	Lin Deng, Ming Lou, Yongbing Li, Blair E. Carlson	Thermally assisted self-piercing riveting of aluminum AA6061-T6 to ultra-high strength steels

0910-1040 103	**Session 9-1-1 - Student Manufacturing Design Competition - Session I** *Session Chair: Laine Mears*	
09:10	Christopher-Denny Matte, Michael Pearson, Felix Trottier-Cournoyer, Andrew Dafoe	Multimaterial DLP 3D Printer
09:30	Joslyn Garcia, Michelle Kwan, Tammy Ngo, Michael Thornbury, Melissa Saldivar	XyloRen Bot
09:50	Joshua Chari, Joshua Torres, Collin Godfrey, Colin Wyatt, Rami Masoud, Abdul Awad	Wire Chopper for Ultra High Performance Fiber Reinforced Concrete
10:10	Jennifer Shaffer, Kenneth Maassen, Cameron Blevins, Cole Crawford, Maxwell Ames, Kristen Meyers, Christopher Tigges	Automated Ultrasonic Soldering Design Project using Ceramic Substrates

1100-1230 103	**Session 1-2-8 - Symposium Invited Speaker: Metallurgical Issues and Quality Control in Selective Laser Melting of Aerospace Materials** *Session Chair: Arif Malik | Session Co-Chair: Kevin Chou*	
MSEC2018-6817	Xinhua Wu	Metallurgical Issues and Quality Control in Selective Laser Melting of Aerospace Materials

1100-1230 403	**Session 2-1-2 - Robotic Machining - II** *Session Chair: Hongliang Wang | Session Co-Chair: Huimin Li*	
MSEC2018-6476	Shaochun Sui, Kai Guo, Jie Sun, Yiran Zhang	Study On Improving Accuracy In Robotic Milling Of Aluminum Alloy
MSEC2018-6554	Hua-Wei Ko, Patrick Bazzoli, J. Adam Nisbett, Douglas Bristow, Yujie Chen, Shiv G. Kapoor, Placid Ferreira	Machine-Tool Error Observer Design with Application to Thermal Error Tracking
MSEC2018-6655	Yao Li, T. Kesavadas	Brain Computer Interface Robotic Co-workers: Defective Part Picking System

1100-1230 405	**Session 2-3-1 - Industry Perspective on Advanced Monitoring, Diagnostic, and Prognostic Technologies** ***Session Chair: Michael P. Brundage | Session Co-Chair: Brian Weiss***	
MSEC2018-6619	Radu Pavel, Laura Pahren, Dave Wickelhaus	An MTConnect-based Approach for Machine Health and Tool Condition Monitoring
MSEC2018-6635	Nikunj Mehta, Greg Olsen, P Nicholas Pritchard	A Machine Learning System and Approach for Time Series Pattern Discovery and Condition Monitoring of Manufacturing Systems
MSEC2018-6661	Joel Neidig	Initial Measurement Unit Diagnostics Correlated with MTConnect Data
1100-1230 407	**Session 2-8-1 - Advances in Data Management for the Digital Thread in Manufacturing - I** ***Session Chair: Thomas Hedberg | Session Co-Chair: Dazhong Wu***	
MSEC2018-6305	Craig Shakarji, Vijay Srinivasan	Toward a New Mathematical Definition of Datums in Standards to Support Advanced Manufacturing
MSEC2018-6391	Jorge D. Camba, Manuel Contero, Pedro Company, David Perez-Lopez, Jeffrey Otey	Identifying High-Value CAD Models: An Exploratory Study on Dimensional Variability as Complexity Indicator
MSEC2018-6649	Atin Angrish, Benjamin Craver, Xiwen Xu, Binil Starly	A Search Engine For Manufacturers Using Product Manufacturing Information (PMI) Enhanced 3D Model Search
1100-1230 G103	**Session 4-5-1 - Mechanics of Machining - I** ***Session Chair: Dinakar Sagapuram | Session Co-Chair: Christopher Saldana***	
MSEC2018-6425	Sathish Kannan, Kui Liu, Salman Pervaiz, Vincent Shantha Kumar, Ram Karthikeyan	Edge Profiling of titanium alloys and attainable surface quality
MSEC2018-6566	Jason Wolf, Christopher Saldana, Tom Maloney, Jack Quitter, John von Roemer	Machining Performance and Microstructure Evolution in Milling Advanced Low-Alloy Military-Grade Steel
MSEC2018-6621	James Mann, Christopher Saldana, Srinivasan Chandrasekar	Consolidation of Nanostructured Metal Powders Produced by Modulation-Assisted Machining

MSEC TECHNICAL SESSIONS

1400-1530 101	**Session 1-2-1 - Advances in Additive Manufacturing Process Design & Part Performance - Process Design I** ***Session Chair: Alessandro Fortunato | Session Co-Chair: Alessandro Ascari***	
MSEC2018-6389	Diptanshu ., Erik Young, Chao Ma, Suleiman Obeidat, Bo Pang, Nick Kang	Ceramic Additive Manufacturing Using Vat Photopolymerization
MSEC2018-6688	Abhinav Bhardwaj, Na Zou, Zhijian Pei	Additive Manufacturing for Civil Infrastructure Design and Construction: Current State and Gaps
MSEC2018-6709	Sagil James, Rinkesh Contractor, Chris Veyna, Galen Jiang	Fabrication Of Efficient Electrodes For Dye Sensitized Solar Cells Using Additive Manufacturing
1400-1530 403	**Session 2-2-2 - Advances in Cyber Physical Systems, Stochastic Modeling, and Sensor Networks in Advanced Manufacturing - II** ***Session Chair: Prahalada Rao | Session Co-Chair: Jaydeep Karandikar***	
MSEC2018-6511	Xingtao Wang, Robert E. Williams, Michael P. Sealy, Prahalada Rao, Yuebin Guo	Stochastic Modeling and Analysis of Spindle Energy Consumption During Hard Milling with a Focus on Tool Wear
MSEC2018-6523	Farhad Imani, Bing Yao, Ruimin Chen, Prahalada Rao, Hui Yang	Fractal pattern recognition of image profiles for manufacturing process monitoring and control
MSEC2018-6624	Ariyan M. Kabir, Aniruddha V. Shembekar, Rishi K. Malhan, Rohil Aggarwal, Joshua D. Langsfeld, Brual Shah, Satyandra Gupta	Robotic Finishing of Interior Regions of Geometrically Complex Parts
1400-1530 401	**Session 4-1-1 - Advances in Processing and Design of Polymers and Polymer Composites - I** ***Session Chair: Nestor Vasquez | Session Co-Chair: Felicia Stan***	
MSEC2018-6413	Fabrizio Quadrini, Denise Bellisario, Loredana Santo	Design Of Nano-Filled Pet Sheets With Enhanced Barrier Properties
MSEC2018-6598	Yijun Chen, Jizhe Cai, James G. Boyd, Mohammad Naraghi	Processing-Mechanical Property Relationship of Hollow and Porous Carbon Fibers Fabricated by Coaxial Electro-spinning
MSEC2018-6422	Daniele Santoro, Umberto Lecci, Fabrizio Quadrini, Loredana Santo	Structural design of hybrid processing unit chassis for airborne electronic systems

1400-1530 103	**Session 4-2-6 - Symposium Invited Speaker: Impulse Joining and Manufacturing: Methods and Opportunities** *Session Chair: Arif Malik | Session Co-Chair: Wayne Cai*	
MSEC2018-6818	Glenn Daehn	Impulse Joining and Manufacturing: Methods and Opportunities

1400-1530 405	**Session 5-1-1 - Medical Devices and Soft Tissue Cutting** *Session Chair: Barbara Linke | Session Co-Chair: Yancheng Wang*	
MSEC2018-6358	Barbara Linke, Anthony Toribio, Shannon Geary, Ulf P Neumann, Anjali Roeth	Performance Testing of Endoscopic Biopsy Forceps
MSEC2018-6366	Lingfeng Zhu, Yancheng Wang, Xin Wu, Deqing Mei	A Flexible Tactile Sensor Based On Porous Graphene Sponge For Tiny Force Measurement
MSEC2018-6575	Murong Li, Yong Lei	Repeatability Assessment and Sensitivity Analysis of Needle Insertion Physical Experiment

1400-1530 G102	**Session 5-7-1 - Cloud-based Smart Manufacturing - I** *Session Chair: Xun Xu*	
MSEC2018-6538	Lixue Jin, Wenjun Xu, Zhihao Liu, Junwei Yan, Zude Zhou, Duc Truong Pham	Knowledge Sharing and Evolution of Industrial Cloud Robotics
MSEC2018-6559	Qiunan Meng, Yingying Sun, Xun Xu, Shiqiang Yu	Batch-Sequencing With Improved Ant Colony Algorithm For Synchronous Flow Shop Under Supply Of Components

1500-1700 Concourse	Session 6-1-1 - Poster Presentation Session - I *Session Chair: Zhijian Pei | Session Co-Chair: Arif Malik*	
MSEC2018-6798	Roozbeh (Ross) Salary, Jack Lombardi III, Darshana L. Weerawarne, Prahalada Rao, Mark Poliks	Real-time Monitoring and Control of Aerosol Jet Printing Process
MSEC2018-6800	Wenchao Du, Xiaorui Ren, Chao Ma, Zhijian Pei	Hierarchical Granules as Feedstock for 3D Printing of Ceramics
MSEC2018-6794	Wenchao Du, Xiaorui Ren, Yexiao Chen, Chao Ma, Miladin Radovic, Zhijian Pei	Model Guided Mixing of Ceramic Powders with Graded Particle Sizes in Binder Jetting Additive Manufacturing
MSEC2018-6796	Toru Kizaki, Tatsuya Fujii, Masatoshi Iwama, Naohiko Sugita	Design Method of CFRP-Elastomer Composite for Structure of Machine Tools
MSEC2018-6315	Xiao Chen, Jianfeng Xu, Zhenzhou Ren, Yan Zhu	Three-dimensional Optical Micro-arrays Machined by Focus Ion Beam Milling
MSEC2018-6801	Peng Yao, Zhenzhong Zhang, Chong Wang	Dressing of Diamond Grinding Wheel With Abrasive Waterjet
MSEC2018-6802	Yihao Zheng, Jingxuan Lyu, Yang Liu, Jason Lo, Ata Susamaz, Hitinder S Gurm, Albert Shih	Grinding Wheel Motion and Force During Plaque Removal by Atherectomy in Angulated Coronary Artery
MSEC2018-6803	Abhinav Bhardwaj, Na Zou, Zhijian Pei	Additive Manufacturing for civil infrastructure Construction
MSEC2018-6372	Jae-Chang Lee, Hoon-Hee Lee, Seung-Han Yang	Novel estimation technique of squareness error based on reversal method for multi-linear axes system
MSEC2018-6390	Jiacheng Huang, Zhe Xu, Majid Minary	Bioinspired nacre-like ceramic with nickel inclusions fabricated by freeze casting and Spark Plasma Sintering
MSEC2018-6393	Z.M. Kilic, O. Tuysuz, Y. Altintas	Accurate axial force prediction in orbital drilling
MSEC2018-6514	Tyler Farthing, Santanu Mukherjee, Gurpreet Singh	3-D Printing with Carbon Nanotube Composites
MSEC2018-6534	Yi-Heng Tseng, Meng-Kun Liu, Chen-Yang Lan	Tool wear monitoring and prediction based on sound and vibration analysis
MSEC2018-6536	Jiwoong Lee, Hyun Jung Choi, Inwoong Noh, Sang Ik Jeong, Sang Won Lee	Development of online condition monitoring and fault detection system for industrial vertical articulated robot using support vector machine algorithm

MSEC2018-6546	Ratnam Paskaramoorthy, Oscar Asumani, Shanmugavel Balasivanandha Prabu	Influence of CNTs on the Mechanical Strength of Kenaf Fibre Reinforced Polypropylene Composites
MSEC2018-6618	Sarang Supekar, Diane J. Graziano, Joe Cresko	Assessing Trends in Smart Manufacturing Innovation Using Patents
MSEC2018-6714	Jin Woo Kim, Byoung Joo Kang, Sang Won Lee	A Study on Micro-Drilling Process of Carbon Fiber Reinforced Plastic (CFRP) Composite Material Using Air-Flow Assisted Nano-Solid Lubrication
MSEC2018-6716	Jung Sub Kim, Chang Su Lee, Sang Won Lee	Development of Monitoring and Quality Prediction System for Fused Deposition Modeling Process Using Graphene-ABS Composite Material
MSEC2018-6732	Hui Wang, Fuda Ning, Yingbin Hu, Yuanchen Li, Weilong (Ben) Cong	Edge Trimming of CFRP Composites Using Rotary Ultrasonic Machining: Effects of Ultrasonic Vibration
MSEC2018-6734	Chien-Chon Chen, Po-Chun Chen	Manufacturing High Quality Anodic Aluminum Oxide Template
MSEC2018-6652	Ala'Aldin Alafaghani, Ala Qattawi	Investigating the effect of fused deposition modeling processing parameters using Taguchi design of experiment method

1550-1720 101	**Session 1-2-2 - Advances in Additive Manufacturing Process Design & Part Performance - Process Design II** ***Session Chair: Alessandro Fortunato | Session Co-Chair: Alessandro Ascari***

MSEC2018-6561	Dong Min Kim, Eunju Park, Hyung Wook Park, Namhun Kim	Experimental investigation on tool wear during the milling processes for the post-processing of selective laser melted inconel 718 alloys
MSEC2018-6620	Prahar M. Bhatt, Max Peralta, Hugh Bruck, Satyandra Gupta	Robot Assisted Additive Manufacturing of Thin Multifunctional Structures
MSEC2018-6643	Lu Lu, Shan Hu, Yayue Pan	3D Printed Particle-Polymer Composites with Acoustically Localized Particle Distribution for Thermal Management Applications

MSEC TECHNICAL SESSIONS

1550-1720 403	**Session 1-3-1 - Advances in Micro- and Nano-Additive Manufacturing - I** ***Session Chair: Howon Lee | Session Co-Chair: Xiangfan Chen***	
MSEC2018-6302	Xiangfan Chen, Wenzhong Liu, Biqin Dong, Henry Oliver T. Ware, Hao F. Zhang, Cheng Sun	High-Throughput 3D Printing of Customized Imaging Lenses
MSEC2018-6365	Ali Behroozfar, Soheil Daryadel, Seyedreza Morsali, Rodrigo Bernal, Majid Minary-Jolandan	Printing Of Microscale Nanotwinned Copper Interconnections Using Localized Pulsed Electro-Deposition (L-PED)
MSEC2018-6562	Chen Yang, Manish Boorugu, Andrew Dopp, Howon Lee	Lightweight Microlattice With Tunable Mechanical Properties Using 3D Printed Shape Memory Polymer
1550-1720 405	**Session 2-3-2 - Measurement Science to Verify and Validate Advance Monitoring, Diagnostic, and Prognostic Technologies** ***Session Chair: Brian Weiss | Session Co-Chair: Michael P. Brundage, Radu Pavel***	
MSEC2018-6492	Michael P. Brundage, Thurston Sexton, KC Morris, Sascha Moccozet, Michael Hoffman	Developing Maintenance Key Performance Indicators From Maintenance Work Order Data
MSEC2018-6603	Guixiu Qiao, Brian Weiss	Monitoring, Diagnostics, and Prognostics for Robot Tool Center Accuracy Degradation
MSEC2018-6617	Alexander Klinger, Brian Weiss	Robotic Work Cell Test Bed to Support Measurement Science for Monitoring, Diagnostics, and Prognostics
1550-1720 Burkhardt	**Session 3-2-1 - Advances in Nontraditional Manufacturing Processes - I** ***Session Chair: Tom M. Lawrence***	
MSEC2018-6321	Tom M. Lawrence, Marvin D. Kemple	Use of Programmed Piezo Crystal Flexures for Economic Vapor Deposition of Parylene HT® on Unlimited Lengths of Magnet Wire
MSEC2018-6540	Roan M. Kirwin, Md. Rashef Mahbub, Muhammad Jahan	Investigating the Effect of Wire Feed Rate and Wire Tension on the Corner and Profile Accuracies during Wire-EDM of Ti-6Al-4V

1550-1720 G103	**Session 3-3-1 - Sensing** *Session Chair: Robert Landers | Session Co-Chair: Jarred Heigel*	
MSEC2018-6453	Ye Zhu, Lianpo Wang, Yonggang Gu, Chao Zhai, Baoyang Jiang, Jun Ni	A Laser Triangulation-based 3D Measurement System for Inner Surface of Deep Holes
MSEC2018-6670	Jagadeesh Govindaraj, Sathyan Subbiah	Experimental Investigation Of Charged Particles Emission In Machining: Towards Process Monitoring
MSEC2018-6680	Achyuth Kothuru, Sai Prasad Nooka, Rui Liu	Audio-Based Condition Monitoring in Milling of the Workpiece Material with the Hardness Variation Using Support Vector Machines and Convolutional Neural Networks
1550-1720 407	**Session 3-4-1 - Advances in Assisted / Augmented Manufacturing Processes - I** *Session Chair: Brad Kinsey | Session Co-Chair: Brandt Ruszkiewicz*	
MSEC2018-6597	Anant Kumar Singh, Manpreet Singh	Parametric Optimization for Nano-Finishing of the External Cylindrical Surfaces Using Rotating Core Magnetorheological Finishing Process
MSEC2018-6625	Brad Kinsey, Benjamin Mitchell, Joseph Klewicki, Glenn Shwaery, Yannis Korkolis	Comparison of Load Induced by Liquid Jet Versus Droplet Train
MSEC2018-6684	Vyas Mani Sharma, Debanjan Maity, Vikranth Racherla, Surjya K. Pal	Friction Sintering Of Copper Powder Using a New Rapid, Cost Effective and Energy Efficient Process
1550-1720 G101	**Session 3-5-2 - Manufacturing Process - I** *Session Chair: Jianfeng Ma | Session Co-Chair: Jing Shi*	
MSEC2018-6647	Sagil James, Abhishek Sonate, Christopher Dang, Lenny De La Luz	Experimental And Simulation Study Of Ultrasonic Additive Manufacturing Of CFRP/ Ti Stacks
MSEC2018-6696	Jin Wang, Jing Shi, Yuli Hu, Yi Wang, Jun Dai, Kewei Xu	Fast Computation Of Thermal Field Of Direct Metal Deposition: A Preliminary Study Based On Quiet Element Method
MSEC2018-6577	Abdelrahman Shuaib, Ahmed Mahgoub, Abdelaziz Bazoune, Fadi Al-Badour, Necar Merah	Effect of Welding parameters on temperature distribution during friction stir spot welding of commercial pure copper lap joint

1550-1720 401	**Session 4-1-2 - Friction Stir Welding of Polymers and Polymer Nanocomposites** *Session Chair: Yong Gan | Session Co-Chair: Denise Bellisario*	
MSEC2018-6318	Jamal Sheikh-Ahmad, Dima Ali, Firas Jarrar, Suleyman Deveci	A study of friction stir welding of high density polyethylene
MSEC2018-6317	Felicia Stan, Nicoleta V. Stanciu, Catalin Fetecau, Laurentiu I. Sandu	Characterization of Welding Attributes in Friction Spot Stir Welding of High-Density Polyethylene/Multi-Walled Car-bon Nanotube Composites
1550-1720 G102	**Session 4-7-1 - Advances in Metal Matrix Nanocomposites** *Session Chair: Yachao Wang | Session Co-Chair: Chao Ma*	
MSEC2018-6610	Enrique Martinez-Franco, Ming Li, Ricardo Cuenca-Alvarez, Jesus Gonzalez-Hernandez, Chao Ma, Juan Manuel Alvarado-Orozco	Nickel/alumina Metal Matrix Nanocomposites Obtained by High-Energy Ball Milling and Spark Plasma Sintering
MSEC2018-6676	Ming Li, Chao Ma, Alex Fang, Zhijian Pei	Preparation of Metal Matrix Nanocomposite Powder Using Electroless Plating
MSEC2018-6694	Yachao Wang, Jing Shi	Microstructure And Tensile Properties Of Slm Graphene Reinforced Inconel 7188 Alloy After Post Heat Treatment
1550-1720 103	**Session 9-1-2 - Student Manufacturing Design Competition - Session II** *Session Chair: Laine Mears*	
15:50	Tucker Siuts, Shravan Patel, Qais Majid, Christos Makrides, Jonathan Hastings, Skyler Pullin	Automated 7.62 Disintegrating Belt Linker
16:10	"Hyenjin Jeong, Michael Locke, Colten Tenney, Graeme Bignell"	Automated Defect Inspection
16:30	Shutao Cai, Junting Chen, Zeyi Yang, Tianqi Zheng	One-dimension-limitless 3D Printing in Space
16:50	Jennifer Elliot, Rachel Bax, Zachary Gateley, Gabriela Moreno Lopez	Autonomous Projectile-Launching Robot

TUESDAY, JUNE 19, 2018

NAMRC TECHNICAL SESSIONS

0910-1040 G102	NAMRC - TRACK 2 Manufacturing Processes - Material fabrication 1 *Session Chair: Gracious Ngaile*	
Paper 71	Naresh Kumar Maroju and Xiaoliang Jin	Vibration-assisted dimple generation on bulk metallic glass
Paper 82	Xiangcheng Kong, Chuang Wei, Yong Zhu, Paul Cohen and Jingyan Dong	Modeling of Catalyst-free Growth Process of ZnO Nanowires
Paper 103	Yiwei Han and Jingyan Dong	Fabrication of Self-Recoverable Flexible and Stretchable Electronic Devices

0910-1040 101	NAMRC - TRACK 2 Manufacturing Processes - Forming *Session Chair: Stefania Bruschi*	
Paper 6	Adam Stroud and Atila Ertas	Integration of a rolling process to finish titanium extruded material
Paper 64	Kadephi Vuyolwethu Mjali and Annelize Botes	The Influence of the Concept of Line Energy on the Mechanical Properties of Laser Formed Commercially Pure Grade 2 Titanium Alloy Plates
Paper 177	Shunyi Zhang, Ali Nassiri and Brad Kinsey	Numerical Model and Experimental Investigation of Electromagnetic Tube Compression with Field Shaper

0910-1040 402	NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 1 *Session Chair: John Agapiou*	
Paper 21	Daniel Kho, Seungmin Lee and Ray Y. Zhong	Big Data Analytics for IoT-enabled manufacturing
Paper 42	Hongliang Wang, Chen Zhou, Thomas Perry and James Schroth	Effect of Processing Conditions and Interfacial Geometry on Reaction Metallurgical Joining of Copper
Paper 241	Sudhanshu Nahata, Recep Onler, Emrullah Korkmaz and Burak Ozdoganlar	Radial Throw at the Cutting Edges of Micro-Tools When Using Ultra-High-Speed Micromachining Spindles

0910-1040 404	**NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 1** *Session Chair: Livan Fratini*	
Paper 58	Tinu P Saju and Ganesh R Narayanan	Effect of hole diameter on joint strength and joint formation in Dieless friction stir form joints between dissimilar aluminum alloy sheets
Paper 150	Dario Baffari, Gianluca Buffa, Davide Campanella, Ernesto Lo Valvo and Livan Fratini	Experimental and numerical investigation on a new FSW based metal to composite joining technique
Paper 185	Venkata Rajesh Saranam and Brian Paul	Feasibility of Using Diffusion Bonding for Producing Hybrid Printed Circuit Heat Exchangers for Nuclear Energy Applications

0910-1040 406	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Simulation 1** *Session Chair: Zhaoyan Fan*	
Paper 80	Shady Salama and Amr Eltawil	A Decision Support System Architecture Based on Simulation Optimization for Cyber-Physical Systems
Paper 163	Alireza Zarreh, Can Saygin, Hung-Da Wan, Yooneun Lee and Alejandro Bracho	A Game Theory Based Cybersecurity Assessment Model for Advanced Manufacturing Systems
Paper 101	Liwen Hu, Ngoc-Tu Nguyen, Wenjin Tao, Ming C. Leu, Xiaoqing Frank Liu, Md Rakib Shahriar and S M Nahian Al Sunny	Modeling of Cloud-Based Digital Twins for Smart Manufacturing with MTConnect

0910-1040 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining** *Session Chair: Murali Sundaram*	
Paper 57	Hussien Hegab, Basil Darras and Hossam Kishawy	Sustainability Assessment of Machining with Nano-Cutting Fluids
Paper 131	Qi Deng, Tianlin Yang, Zhiyong Chang, Ronghan Shen and Yimeng Zhou	A Model for Investigating the Temperature of Trochoidal machining
Paper 122	Shaowu Gao, Changyong Yang, Jiuhua Xu, Hao Su and Yucan Fu	Modelling and simulation of bore diameter evolution in finish honing

NAMRC TECHNICAL SESSIONS

1100-1230 G101	NAMRC - TRACK 1 Manufacturing Systems - Optimization *Session Chair: Xun Xu*	
Paper 18	Padmakar Pawar and Keshav Nandurkar	Optimization of Single Supplier Multi Buyer Multi Product Supply Chain System
Paper 50	Amin Abedini, Wei Li and Honghan Ye	Stochastic bi-level optimization models for efficient operating room planning
Paper 73	Ishant Gupta, Parveen Kalra, Puneet Chawla and Jagjit Singh	Evaluation of Pilot's Seat Design of Civil Aircraft for Indian Anthropometric Data by using Delmia Human Software

1100-1230 G102	NAMRC - TRACK 2 Manufacturing Processes - Material fabrication 2 *Session Chair: Gracious Ngaile*	
Paper 196	Jia Deng, Jingyan Dong, Paul Cohen	Rapid Fabrication and Characterization of SERS Substrates
Paper 206	Zheng Kang and Benxin Wu	Coalescence of gold nanoparticles around the end of a carbon nanotube: a molecular-dynamics study
Paper 214	Abdolreza Javadi, Shuaihang Pan and Xiaochun Li	Fabrication of High Strength Al Nanocomposites with Populous TiB2 Nanoparticles

1100-1230 101	NAMRC - TRACK 2 Manufacturing Processes - Design *Session Chair: Stefania Bruschi*	
Paper 51	Maxwell Praniewicz, Thomas Kurfess and Christopher Saldana	Adaptive geometry transformation and repair for hybrid manufacturing
Paper 169	Santosh Reddy Sama, Jiayi Wang and Guha Manogharan	Non-Conventional Mold Design for Metal Casting using 3D Sand-Printing
Paper 170	Katsuyuki Hara, Toshikazu Uchida, Yosuke Watanabe, Norimichi Nanami, Hayato Nakatani and Hiroyuki Hamada	Evaluation of Flexural properties of the U-shape Composite Spring.

1100-1230 401	NAMRC - TRACK 3 Additive Manufacturing - Process Design *Session Chair: Yong Huang*	
Paper 175	Hao Zhang, Jacquelyn K. Nagel, Abdulrahman Al-Qas, Evan Gibbons, Jenifer Joo-Yeon Lee	Additive Manufacturing with Bioinspired Sustainable Product Design: A Conceptual Model
Paper 184	Amm Nazmul Ahsan and Bashir Khoda	Honeycomb pattern on thin wall object with grain based 3d printing
Paper 211	Erick Ramirez-Cedillo, Jesus A. Sandoval-Robles, Alberto Caballero-Ruiz, Leopoldo Ruiz-Huerta, Ciro A. Rodriguez and Hector R. Siller	Process planning guidelines in selective laser melting for the manufacturing of stainless steel parts

1100-1230 402	NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 2 *Session Chair: John Agapiou*	
Paper 109	John Agapiou	Performance Evaluation of Cutting Fluids with Carbon Nano-Onions as Lubricant Additives
Paper 114	Krishnan Krishnaiyer, F. Frank Chen, Brandon Burgess and Hamed Bouzary	D3S Model for Sustainable Process Excellence
Paper 123	Selvakumaran D, Arunachalam N, Vijayaraghavan L and Balan A.S.S	Performance Comparison of Sol-gel with White Alumina Abrasives for Grinding of Super Duplex Stainless Steel (SDSS)

1100-1230 404	NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 2 *Session Chair: Livan Fratini*	
Paper 142	R Indhu, S Divya, M Tak and S Soundarapandian	Microstructure development in Pulsed Laser Welding of Dual Phase Steel to Aluminium Alloy
Paper 227	Kuan-Yu Su, Torgeir Welo, Jyhwen Wang	Improving Friction Drilling and Joining through Controlled Material Flow
Paper 230	Guillaume Filliard, Mohamed El Mansori, Mathieu De Metz-Noblat, Christian Bremont, Anthony Reullier and Lucio Tirado	Influence of process parameters on thermal cycle and intermetallic compounds formation in high speed laser weld-brazing of aluminium-steel angle joints

NAMRC TECHNICAL SESSIONS

1100-1230 406	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Simulation 2** *Session Chair: Zhaoyan Fan*	
Paper 60	Alejandro Bracho Avila, Can Saygin, Hung-Da Wan, Yooneun Lee and Alireza Zarreh	A Simulation-Based Platform for Assessing the Impact of Cyber-Threats on Smart Manufacturing Systems
Paper 30	Michael Königs and Christian Brecher	Process-parallel virtual quality evaluation for metal cutting in series production
Paper 87	Wenjin Tao, Ze-Hao Lai, Ming C. Leu and Zhaozheng Yin	Worker Activity Recognition in Smart Manufacturing Using IMU and sEMG Signals with Convolutional Neural Networks

1100-1230 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 2** *Session Chair: Murali Sundaram*	
Paper 4	Hukuzo Yagishita and Yuki Morita	Effect of Phase Transformation upon Hole Making Accuracy of Ti6Al4V by Orbital Drilling
Paper 66	Sven Klein and Dirk Bähre	Analysis of the Movements in Relation to the Degrees of Freedom in Precision Honing
Paper 191	Abram Pleta, Farbod Akhavan Niaki and Laine Mears	A comparative study on the cutting force coefficient identification between trochoidal and slot milling

1400-1530 G101	**NAMRC - TRACK 2 Manufacturing Processes - Micro-machining** *Session Chair: Yuebin Guo*	
Paper 43	Jue-Hyun Lee and Angela Sodemann	Geometrical Simulation of Chip Production Rate in Micro-EndMilling
Paper 92	Jungsoo Nam, Jin Woo Kim, Jung Sub Kim, Jiwoong Lee and Sang Won Lee	Parametric analysis and optimization of nanofluid minimum quantity lubrication micro-drilling process for titanium alloy (Ti-6Al-4V) using response surface methodology and desirability function
Paper 203	Rinku Mittal, Salil S. Kulkarni and Ramesh Singh	Multiple Degree of Freedom Rotordynamics based Stability Modeling in High-speed Micromilling of Ti-6Al-4V

1400-1530 402	**NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 3** ***Session Chair: Johnson Samuel***	
Paper 135	Kunal Tiwari, Ameer Shaik and Arunachalam N	Tool wear prediction in end milling of Ti-6Al-4V through Kalman filter based fusion of texture features and cutting forces
Paper 146	R. Dwaraka and N. Arunachalam	Investigation on non-invasive process monitoring of Die Sinking EDM using Acoustic Emission signals
Paper 148	Jie Gu and John Agapiou	Assessment and Implementation of Global Offset Compensation Method

1400-1530 404	**NAMRC - TRACK 3 Additive Manufacturing - Post-processing** ***Session Chair: Bruce L. Tai***	
Paper 232	Jie Jin, Jingfan Yang, Huachao Mao and Yong Chen	A vibration-assisted method to reduce separation force for Stereolithography
Paper 233	Nan Kang, Mohamed El Mansori, Nicolas Coniglio and Christian Coddet	Nano-wear-induced behavior of selective laser melting commercial pure titanium

1400-1530 406	**NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 3** ***Session Chair: Brad Kinsey***	
Paper 65	Lang Shi, Angie Price and Wayne Hung	Use Of Contour Method For Welding Residual Stress Assessment
Paper 138	Saheem Absar, Brandt Ruszkiewicz, Jamie Skovron, Laine Mears, Tim Abke, Xin Zhao and Hongseok Choi	Temperature measurement in friction element welding process with micro thin film thermocouples
Paper 172	Lihang Nong, Chenhui Shao, Tae Hyung Kim and S. Jack Hu	Improving Process Robustness in Ultrasonic Metal Welding of Lithium-Ion Batteries

NAMRC TECHNICAL SESSIONS

1400-1530 407	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Cloud Manufacturing** *Session Chair: Robert Gao*	
Paper 61	Hamed Bouzary, F. Frank Chen and Krishnan Krishnaiyer	Service matching and selection in cloud manufacturing: a state-of-the-art review
Paper 219	Jorge E. Correa, Ricardo Toro and Placid M. Ferreira	A New Paradigm for Organizing Networks of Computer Numerical Control Manufacturing Resources in Cloud Manufacturing

1400-1530 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 3** *Session Chair: Steven Schmid*	
Paper 100	Hae-Sung Yoon, Seola Lee and Sangkee Min	Investigation of ductile-brittle transition in machining of yttrium-stabilized zirconia (YSZ)
Paper 104	Chandra Nath	Chip Morphology Study in Drilling of Stainless Steel AISI 304
Paper 143	Martin Seimann, Bingxiao Peng, Fritz Klocke and Benjamin Doebbeler	Multi Flank Chip Formation in Fir-Tree Broaching Inconel 718 with Cemented Carbide

1550-1720 402	**NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 4** *Session Chair: Lei Chen*	
Paper 155	Thomas Hitchcox and Yaoyao Fiona Zhao	Random walks for unorganized point cloud segmentation with application to aerospace repair
Paper 174	Suleiman Obeidat and Wayne Hung	Inspection Path planning of Free Form Surfaces Using Virtual Machining
Paper 225	Paolo Parenti, Francesco Cacciatore, Andrea Ratti and Massimiliano Annoni	A graphical method for performance mapping of machines and milling tools

1550-1720 404	**NAMRC - TRACK 3 Additive Manufacturing - Case studies** *Session Chair: Bruce L. Tai*	
Paper 130	U Harikrishnan and S Soundarapandian	Fused Deposition Modelling based Printing of Full Complement Bearings
Paper 224	Olivia Formoso, Greenfield Trinh, Steven Hu and Kenneth Cheung	Development and Robustness Characterization of a Digital Material Assembly System
Paper 231	Xiangjia Li, Benshuai Xie, Jie Jin, Yang Chai and Yong Chen	3D Printing Temporary Crown and Bridge by Temperature Controlled Mask Image Projection Stereolithography

1550-1720 406	**NAMRC - TRACK 2 Manufacturing Processes - Composite Forming** *Session Chair: Brad Kinsey*	
Paper 40	Kai Morikawa, Micah Green and Mohammad Naraghi	A Novel Approach for Melt Electrospinning of Polymer Fibers
Paper 81	Mohammad Ali Davarpanah and Rajiv Malhotra	Formability and failure modes in Single Point Incremental Forming of Metal-Polymer Laminates
Paper 187	Stephanie Hulsey, Saheem Absar and Hongseok Choi	Investigation of simultaneous ultrasonic processing of polymer-nanoparticle solutions for electrospinning of nanocomposite nanofibers

WEDNESDAY, JUNE 20, 2018

TIME	LOCATION	EVENT
07:00 - 18:00	Lobby	Registration/Information
07:00 - 08:00	Legacy Club - 4th Floor	Continental Breakfast
08:00 - 09:00	Main Hall	Keynote - Deborah Wince-Smith
09:10 - 10:40		Technical Session 5
09:10 - 10:40	103	Federal Agencies' Perspectives on Advanced Manufacturing
10:00 - 17:00	Field Box Concourse	Exhibitor Booths Open
10:40 - 11:00	Field Box Concourse	Break
11:00 - 12:30		Technical Session 6
11:00 - 12:30	103	Symposium Invited Speaker 3 - Dong-Woo Cho
11:00 - 12:30	Burkhardt	What's New at NSF – Update from NSF Program Directors
12:30 - 13:50	Main Hall	ASME/MED Awards Luncheon, with a Special Guest – ASME President-Elect Said Jahanmir
12:30 - 13:50	Private Suite - 4th Floor	SME Journal Editorial Board Meeting
14:00 - 15:30		Technical Session 7
14:00 - 15:30	103	Blue Sky Competition - Session 1
14:00 - 17:30	Off Site	Industrial Tour-Daikin (registration required)
15:00 - 17:00	Field Box Concourse	Poster Session 2
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 8
15:50 - 17:20	103	Blue Sky Competition - Session 2
18:00 - 21:00	103	Early Career Forum
	Off Site	Dinner on Your Own

KEYNOTE SPEAKER

The Honorable Deborah Wince-Smith

President & CEO, United States Council on Competitiveness

Deborah L. Wince-Smith is the president & CEO of the Council on Competitiveness, a coalition of CEOs, university presidents, labor leaders and national laboratory directors, committed to driving U.S. competitiveness. She has more than 20 years of experience as a senior U.S. government official, as the first Senate-confirmed Assistant Secretary for Technology Policy in the U.S. Department of Commerce and Assistant Director for International Affairs in the Reagan White House.

Ms. Wince-Smith is also the president of the Global Federation of Competitiveness Councils, whose creation she led. Ms. Wince-Smith has served as the vice-chair and chair of the World Economic Forum's Global Agenda Council on Competitiveness and is a member of Japan's Science & Technology in Society Forum Council. She is a member of the Commission on the Theft of Intellectual Property, co-chaired by former Governor John Huntsman and former U.S. Director of Naval Intelligence, Admiral Dennis Blair. Ms. Wince-Smith also serves on Purdue University's Strategic Research Advisory Council. Ms. Wince- Smith was previously a member of the Smithsonian National Board and the Naval Academy Foundation Board. She also serves on the boards of several private-sector organizations.

Ms. Wince-Smith earned a degree in classical archaeology and graduated magna cum laude and Phi Beta Kappa from Vassar College. She earned her master's degree from King's College, Cambridge University, and received an honorary doctorate in humanities from Michigan State University, an honorary doctorate in public administration from the University of Toledo, an honorary doctorate of law honoris causa from the Queens University Belfast, and an honorary doctorate of humane letters honoris causa from Worcester Polytechnic Institute.

3D Printing Technology and Its Biomedical Applications

Wednesday, June 20th | 11:00 - 12:30 | Room 103

Professor Dong-Woo Cho

Center for rapid prototyping based 3D tissue/organ printing,
Department of Mechanical Engineering
POSTECH, Korea

Abstract

The research at the Intelligent Manufacturing Systems (IMS) Laboratory is focused in the application of 3D printing technology to the field of biomedical engineering by fabricating complex 3D structures. Specifically, in the IMS laboratory, the 3D printing technology lies at the basis of the research for in vivo tissue regeneration and the development of ex vivo tissue/organ model that relate to the big picture of tissue engineering and regenerative medicine. To begin, the extrusion-based 3D printing technology allows for the precise fabrication of 3D scaffolds up to micro-meter scales. The automated design and fabrication system used along with the 3D printing makes possible the fabrication of patient-specific 3D scaffold with on-going clinical applications at the patient's site of defect. Beyond the fabrication of 3D scaffolds, the IMS laboratory has developed a 3D cell/tissue printing technology for the fabrication of live scaffolds of which the integrated pre-tissues can be fabricated in a single step with the use of multiple types of cells and biological materials. In addition, the laboratory has also developed tissue- and organ-derived extracellular matrix bioink that would optimize the mimicry of the native tissue's biochemical microenvironments and enhance pre-tissues functionalities. Currently, based on the previously mentioned technologies, the IMS laboratory is heading to develop both composite cell-based scaffolds for the treatment of areas of defects and hard-to-cure diseases and ex vivo tissue/organ models for discovery of new drugs and its safety assessment. The following presentation will demonstrate the role and significance of 3D printing in the biomedical field and provide us with a time for deep discussions on the aforementioned research topics.

About Professor Dong-Woo Cho

Professor Dong-Woo Cho received his Ph.D. in Mechanical Engineering from the University of Wisconsin-Madison in 1986. Ever since, he has been a professor of Department of Mechanical Engineering at the Pohang University of Science and Technology. He is director of the Center for Rapid Prototyping-based 3D Tissue/Organ printing. His research interests include 3D microfabrication based on 3D Printing technology, its application to tissue engineering, and more generally to bio-related fabrication. He has recently focused on tissue/organ printing technology and development of high-performance bioinks. He has received several prestigious awards in these academic areas. He serves or has served on the editorial boards of several International Journals. Cho has published over 260 academic papers in various international journals in the field of manufacturing and tissue engineering (>8,100 citations, h-index = 49), and has contributed chapters to ten books and written a textbook related to tissue engineering and organ printing.

Special Session: Federal Agencies' Perspectives on Advanced Manufacturing

Wednesday, June 20th | 9:10 - 10:40 | Room: 103

Organizers: Scott Smith, Brian Paul, and Zhijian (ZJ) Pei

In this special session, representatives from several federal agencies will share their perspectives on Advanced Manufacturing. They will also answer questions from the audience. The panelists are:

Frank W. Gayle is the Deputy Director of the Office of Advanced Manufacturing at the National Institute of Standards and Technology (NIST). NIST's Office of Advanced Manufacturing is responsible for extramural advanced manufacturing programs and serves as a liaison to industry and academia. The interagency Advanced Manufacturing National Program Office coordinates Federal activities in advanced manufacturing, and is the Congressionally-designated National Program Office for Manufacturing USA – the National Network for Manufacturing Innovation. Frank spent 11 years in the aerospace industry before joining NIST. As Division Chief of the NIST Metallurgy Division, Frank developed programs in energy, microelectronics, and mechanical properties, focusing on measurement needs for industry. Frank also led the team of technical experts on the forensics of structural steel in the Congressionally mandated NIST investigation of the World Trade Center disaster on September 11, 2001. Frank earned an Sc.D. in Materials Science from MIT, and degrees in Civil and Mechanical Engineering from Duke University.

Robert W. Ivester currently serves as the Director of the Advanced Manufacturing Office (AMO) in the Office of Energy Efficiency and Renewable Energy. AMO is focused on creating a fertile innovation environment for advanced manufacturing, enabling vigorous domestic development of new energy-efficient manufacturing processes and materials technologies to reduce the energy intensity and life-cycle energy consumption of manufactured products. Prior to this position, he served as the AMO Deputy Director for five years. During that time, AMO launched five Manufacturing USA Institutes, the Critical Materials Hub, and hundreds of small R&D and technical assistance projects across the Nation. He also worked at the National Institute of Standards and Technology for over 16 years, leading and performing research in advanced manufacturing. He has been an instructor for the Johns Hopkins University Engineering for Professionals program for graduate-level studies in manufacturing engineering since 2001. He is a Fellow of SME and the American Society of Mechanical Engineers. He received his doctorate in engineering, a Bachelor of Science in Mechanical Engineering, and Master of Science in Manufacturing Engineering from the University of Massachusetts at Amherst.

A. Adele Ratcliff is currently the Director of the Manufacturing Resiliency & Assurance office and the Industrial Base Analysis & Sustainment Program (IBAS) within the Office of the Deputy Assistant Secretary of Defense (ODASD) for Manufacturing and Industrial Base Policy (MIBP). During her tenure in ODASD, she has focused on building strong interagency partnerships to address broad transition of manufacturing issues such as manufacturing readiness and the Advanced Manufacturing Enterprise. Her current position uses the broad authorities of the IBAS program element to enable a modern Industrial Base that integrates traditional and emerging sectors to be able to respond at will to National Security Requirements. Most recently, as the Director of the DoD Manufacturing Technology Program, Adele led the effort in establishing the DoD's national Manufacturing Innovation Institutes (MIIs) outlined in the President's 2013 State of the Union address, now known as Manufacturing USA Institutes. She has a long acquisition career, including Program Manager for the congressionally mandated Defense Acquisition Challenge Program, Deputy Program Manager for the Foreign Comparative Test Program, and more than eleven years in Air Force Test and Evaluation at Eglin Air Force Base in Florida. As Test Manager, she earned the Air Force Materiel Command Test Engineer of the Year Award. Her efforts transitioned this Platform to support the Warfighter in the initial phases of Operation Enduring Freedom. She is a proud alumnus of the Mississippi State University Bulldogs, earning a BS in Mechanical Engineering in 1988. In 2011 she graduated from the U.S. Army War College (in-residence) earning a MS in Strategic Art and graduated from the DoD's Defense Senior Leadership Development Program. She received the Secretary of Defense Award for Excellence for her support of the Pilot Institute for Additive Manufacturing in March 2013.

Steven R. Schmid received his Bachelor of Science Degree in Mechanical Engineering at the Illinois Institute of Technology; Master of Science and Ph.D. degrees at Northwestern University; and is a Professor at the University of Notre Dame. He conducts research and teaches courses in the general fields of manufacturing, metal forming, tribology, and design. Of his textbooks, Manufacturing Engineering and Technology (with S. Kalpakjian) is the world's most popular manufacturing textbook. Manufacturing Processes for Engineering Materials, Fundamentals of Machine Elements and Fundamentals of Fluid Film Lubrication are some of his other books. In 2012-2013, Dr. Schmid was the first Faculty Fellow at the Advanced Manufacturing National Program Office. His is currently the Program Director for Manufacturing Machines and Equipment at the National Science Foundation, which includes research grants in the additive manufacturing area; he is also the Head of the Advanced Manufacturing cluster of programs. He has won numerous best paper and teaching awards, and served as President of the North American Manufacturing Research Institute from 2015-2016. He is a Fellow of ASME and SME.

John Vickers serves as the principal technologist in the area of advanced materials and manufacturing within the Space Technology Mission Directorate at NASA Headquarters. He also serves as the associate director of the Materials and Processes Laboratory at the NASA Marshall Space Flight Center and as the manager of NASA's National Center for Advanced Manufacturing with operations in Huntsville, Alabama and New Orleans, Louisiana. He has over 30 years of experience in materials and manufacturing -- research and development, engineering, and production operations for propulsion, spacecraft, and scientific space systems. As principal technologist, he leads the nationwide NASA team to develop advanced manufacturing technology strategies to achieve the goals of NASA's missions. He is the Agency representative to the National Science and Technology Council, Subcommittee on Advanced Manufacturing and the Subcommittee on Critical and Strategic Mineral Supply Chains. He is a founding member of the Manufacturing USA - National Network for Manufacturing Innovation program and the Interagency Advanced Manufacturing National Program Office. His many awards include NASA's Exceptional Achievement Medal, NASA's Outstanding Leadership Medal and the AIAA Holger Toftoy award. He is a fellow of SME. He holds a Bachelor of Science in Engineering from the University of Alabama in Huntsville.

Special Session: What's New at NSF – Update from NSF Program Directors

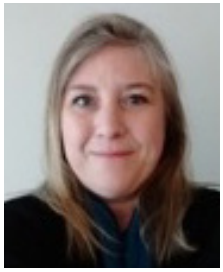
Wednesday, June 20, 2018 | 11:00 - 12:30 | Burkhardt

Organizers: Zhijian (ZJ) Pei, Scott Smith, and Brian Paul

In this special session, four NSF program directors from the NSF Advanced Manufacturing Cluster will update the audience what is new at NSF, especially regarding advanced manufacturing. They will also answer questions from the audience. The panelists at this special session are:

Khershed P. Cooper is Program Director (PD) for the Nanomanufacturing Program in the Civil, Mechanical and Manufacturing Innovation (CMMI) Division of the Engineering Directorate at the National Science Foundation (NSF). He also oversees the Scalable Nanomanufacturing Program and the Manufacturing Nanoscience, Engineering & Technology Centers (NSECs) and serves as a disciplinary PD for the Engineering Research Center (ERC) program. He is NSF representative for National Science & Technology Council (NSTC)'s Nano Science Engineering & Technology (NSET) Sub-committee, and is a member of the National Nanotechnology Initiative (NNI)'s Signature Initiative on Sustainable Nanomanufacturing. He contributes to the development of the Manufacturing USA Institutes. Prior to joining NSF, Khershed was a Program Officer at the Office of Naval Research (ONR) and a Senior Research Metallurgist at the Naval Research Laboratory (NRL), where he studied materials processing, additive and nano manufacturing. He also has industrial research experience. He has nearly 150 publications, over 150 invited talks, and 70 contributed presentations. He has sponsored symposia and workshops in additive and nano-manufacturing. He is a Fellow of ASM International and a recipient of its prestigious Burgess Memorial Award. He received his PhD from University of Wisconsin - Madison.

Bruce Kramer is a graduate of MIT (S.B., S.M., Ph.D) and has served on the faculties of Mechanical Engineering of MIT and George Washington University. He is currently a Senior Advisor at the NSF, coordinating NSF's participation in the National Advanced Manufacturing Program. Dr. Kramer previously directed NSF's Divisions of Design, Manufacture and Industrial Innovation and Engineering Education and Centers. He co-founded Zoom Telephonics of Boston, a NASDAQ company and producer of communications products marketed under the Zoom and Motorola brands, holds three U.S. patents, and is a Fellow of the SME and an International Fellow of the School of Engineering of the University of Tokyo. He has received the F.W. Taylor Medal of CIRP, the ASME Blackall Award, and the R.F. Bunshah Medal of the International Conference on Metallurgical Coatings (ICMC) for his contributions to manufacturing research and the Distinguished Service Award, the highest honorary award granted by the National Science Foundation.



Brigid Mullany received her Bachelor of Engineering Degree and Doctorate in Mechanical Engineering from University College Dublin in Ireland. Upon graduation she received a two-year EU Marie Curie postdoctoral research position at Carl Zeiss in Germany. In 2004 she joined the Department of Mechanical Engineering and Engineering Science at the University of North Carolina at Charlotte where she a Professor working in the area of surface finishing and advanced manufacturing. She received the SME Kuo K Wang Outstanding Young Manufacturing Engineer Award in 2007, and the NSF CAREER award in 2008. Currently she is an Associate Program Director in the Advanced Manufacturing Cluster at the National Science Foundation. She is active in CIRP, and is the Vice Chair of the Scientific Technical Committee on Surfaces (STC-S).

Steven R. Schmid received his Bachelor of Science Degree in Mechanical Engineering at the Illinois Institute of Technology; Master of Science and Ph.D. degrees at Northwestern University; and is a Professor at the University of Notre Dame. He conducts research and teaches courses in the general fields of manufacturing, metal forming, tribology, and design. Of his textbooks, Manufacturing Engineering and Technology (with S. Kalpakjian) is the world's most popular manufacturing textbook. Manufacturing Processes for Engineering Materials, Fundamentals of Machine Elements and Fundamentals of Fluid Film Lubrication are some of his other books. In 2012-2013, Dr. Schmid was the first Faculty Fellow at the Advanced Manufacturing National Program Office. His is currently the Program Director for Manufacturing Machines and Equipment at the National Science Foundation, which includes research grants in the additive manufacturing area; he is also the Head of the Advanced Manufacturing cluster of programs. He has won numerous best paper and teaching awards, and served as President of the North American Manufacturing Research Institute from 2015-2016. He is a Fellow of ASME and SME.

Special Session: David Dornfeld Manufacturing Vision Award and Blue Sky Competition

Wednesday, June 20th

14:00 - 15:30 (Session 1) and 15:50 - 17:20 (Session 2)

Room: 103

Organizers: Brian Paul, Zhijian (ZJ) Pei, and Scott Smith

This is the second David Dornfeld Manufacturing Vision Award and Blue Sky Competition, with funding from National Science Foundation (NSF). It aims to identify areas for emphasis in manufacturing research and education, and to catalyze support for a vision of the future of U.S. manufacturing. The selection committee was responsible for choosing eight finalists (from more than 30 abstracts) to make presentations at these sessions, and also for selecting the recipient of the David Dornfeld Manufacturing Vision Award from these presentations.

The following seven finalists will make presentations (team leader is identified):

- Global Distributed Manufacturing of Personalized Products as a Service (Albert Shih)
- 3D Printing for Civil Infrastructure Construction (Alaa Elwany)
- Personalized Manufacturing: Psychology and Sociology as Fundamental Design

Elements in Future Advanced Production Systems (Laine Mears)

- Metamorphic Manufacturing: The Third Wave in Digital Manufacturing (Glenn Daehn)
- Just-in-Time Learning for the Factory Floor (Jeffrey Reed)
- Distributed Decentralized Rural Agile Manufacturing (Joel Neidig)
- Factories-In-Space (Ajay Malshe)

The selection committee members were:

- DARPA: Bradley Ringeisen (Deputy Director, Biological Technology Office)
- DoD: A. Adele Ratcliff (Director, Manufacturing Resiliency & Assurance and Industrial Base Analysis & Sustainment)
- DoE: Rob Ivester (Director, Advanced Manufacturing Office)
- NASA: John Vickers (Principal Technologist)
- NIST/AMNPO: Frank Gayle (Deputy Director, Office of Advanced Manufacturing)
- AAAS/Science: Bill Moran (Publisher, the Science family of journals)
- Boeing: Steve Walls (Technical Fellow, Production Engineering/Building Integration)
- GE: Dale Lombardo (Technical Operations Leader, Structural Materials Processes & Analytics, GE Global Research Center)
- NCDMM: Ralph Resnick (President and Executive Director)
- NIIMBL: Kristy Pottol (Information and Regulatory Director)
- Saint Gobain: Anand Tanikella (Vice President, R&D Abrasives worldwide)

INDUSTRIAL TOUR: DAIKIN

The conference industry tour will take place at Diakin's new 4.1 million-square-foot, state-of-the-art manufacturing facility. Located midway between Houston and College Station is the Daikin Texas Technology Park. The complex allows Daikin to consolidate manufacturing, engineering, logistics, marketing and sales for Goodman®, Amana® and Daikin brand heating and air conditioning products in a single location.

The facility is designed to better serve customers, employees and the environment. It is engineered from the ground up to encourage collaboration and innovation. Incorporating engineering and manufacturing in one location, product innovations can quickly be tested and implemented into manufacturing processes. Closer collaboration between manufacturing and logistics allows for quick and efficient delivery of needed products.

Research Professions in Academia, Industry & National Laboratories: An Early Career Forum

Organized by: ASME/MED, and NAMRI/SME

Sponsored by: The U.S. National Science Foundation and the University of Wisconsin-Madison's Department of Engineering Professional Development

Department of Engineering Professional Development
UNIVERSITY OF WISCONSIN-MADISON

Wednesday June 20, 2018 - 6:00–9:00 p.m., Texas A&M University, Hall of Champions

The goal of this forum is to provide current students at all levels of graduate and undergraduate programs, as well as recent graduates with better information/knowledge of various research positions in industry, academia and national laboratories. The forum will further discuss how to be successful professionally in the various research settings.

Agenda (Wednesday, June 20, 2018)

18:00 – 18:15: Opening Remarks & Welcome, pizza & beverages served
18:15 – 19:15: 5-minute spoken introduction by each panelist
19:15 – 20:30: Breakout panel discussions
- Panel 1: Academia
- Panel 2: Government
- Panel 3: Industry

20:30 - 21:00: Wrap-up discussion, open questions and answers

Forum Format:

Each panelist will introduce themselves in approximately 5 minutes each. They have experience in conducting research in academic, government labs and industrial sectors. Parallel round table discussions will follow: one for academia, one for government and the other for industry. Panelists will discuss topics, such as how to search for a job, career management, funding for research, etc. Food and beverages will be served during the forum. Participants are encouraged to engage in conversations/discussions related to their particular/personal interests.

Fee: Free for registered conference participants

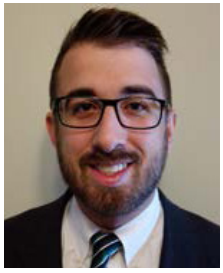
Attendance: Open to all registered conference participants, mandatory for NSF Travel Grant student awardees

ECF Chair: Dr. Johnson Samuel, Associate Professor, Dept. of Mechanical Aerospace and Nuclear Eng., Rensselaer Polytechnic University, NY, 518.276.3682, samuej2@rpi.edu

PANELISTS

Dr. Robin Bright, Norton/Saint-Gobain Abrasives

Robin Bright currently serves as Technology Manager in the Application Engineering group at Saint-Gobain Abrasives, headquartered in Worcester, MA. He joined Saint-Gobain in 2010, after earning his Ph.D. in Materials Science and Engineering from the University of Connecticut, where his researched focused on laser processing of nickel-based superalloys and other materials used in aerospace applications. Additionally, he holds B.S.E. (2005) and M.S. (2007) degrees in Metallurgy and Materials Engineering, also from the University of Connecticut. From 2010 – 2017, he served in various roles within the Grinding and Finishing Technology Group at Saint-Gobain's Northboro, MA Research and Development Center, where he led projects related to the development of new abrasive products and processes, as well as process measurement and analysis techniques. In 2017, he joined the North American Application Engineering team, where he currently works with end-users, grinding machine OEMs, and other partners on the development and deployment of new abrasive technology solutions.



Dr. Michael Brundage, National Institute of Standards and Technology

Michael Brundage, Ph.D. is an Industrial Engineer in the Informational Modeling and Testing Group at the National Institute of Standards and Technology (NIST). Dr. Brundage's interests include Smart Manufacturing Diagnostics for Intelligent Maintenance, Sustainable Manufacturing Performance Measurement, Smart Manufacturing Capability Assessment, and Manufacturing Knowledge Visualization. His work contributes to guidelines for intelligent maintenance and he is part of a task group for creating an ASME Prognostics Health Management (PHM) standards committee. He also worked closely with ASTM International E60.13 in the development of a guideline for sustainable manufacturing performance indicators (ASTM E3096-17). He authored over 20 peer reviewed publications and has chaired multiple ASME MSEC Symposia and industry forums/workshops at NIST. Prior to joining NIST, Dr. Brundage was a member of the Intelligent Systems Laboratory at Stony Brook University, where he received his Ph.D. and M.Sc. in Mechanical Engineering in 2015 and 2013 respectively. His research focused on integrated manufacturing and building automation systems as well as sustainable manufacturing performance indicators. Previously, Michael received his B.Sc. in Mechanical Engineering from the University of Notre Dame in 2010.

Dr. Bryan Chu, Sandia National Laboratories

Bryan Chu is a Systems Engineer at Sandia National Laboratories in Livermore California. He completed a B.Sc. in Mechanical Engineering at Cornell University in 2011 and a Ph.D. at Rensselaer Polytechnic Institute in 2016, studying the mechanics of graphene in micro-machining environments. In 2017, he completed a DARPA-funded post-doc experience involving the creation of ontologies for additive manufacturing processes, also at Rensselaer. Bryan is currently involved in the design, test, and building of components for the W80-4 Life Extension Program. He is also involved in efforts to incorporate Model Based Systems Engineering techniques and Virtual/Augmented Reality technologies into the design lifecycle.

Dr. Michael D. Johnson, Texas A&M University

Dr. Michael D. Johnson is an associate professor in the Department of Engineering Technology and Industrial Distribution at Texas A&M University. He also serves as program coordinator for the Manufacturing and Mechanical Engineering Technology Program. Prior to joining the faculty at Texas A&M, he was a senior product development engineer at the 3M Corporate Research Laboratory in St. Paul, Minnesota. He received his B.S. in mechanical engineering from Michigan State University; he graduated with high honors from the Honors College. Dr. Johnson received his S.M. and Ph.D. from the Massachusetts Institute of Technology. Dr. Johnson's research focuses on design tools; specifically, the cost modeling and analysis of product development and manufacturing systems; computer-aided design methodology; and engineering education. Dr. Johnson has over 60 peer reviewed publications and several patents. His work has been published in the IEEE Transactions on Engineering Management, the Journal of Engineering Education, and the Journal of Engineering Design. Dr. Johnson is a member the American Society for Engineering Education, the American Society of Mechanical Engineers, the Society of Manufacturing Engineers, and a senior member of IEEE.

Dr. Parikshit Mehta, Arconic Technology Center

Parikshit Mehta is Senior Process Control Engineer in Digital Manufacturing and Automation Technology division at Arconic Technology Center. He received his Bachelors in Engineering (B.E. Mechanical) from Nirma Institute of Technology in India in 2005. Following his B.E. he worked as a Field Quality Engineer with Mahindra & Mahindra Automotive Ltd for two years. In 2007, he attended Clemson University to pursue his M.S. in Mechanical Engineering, and continued at Clemson to obtain Ph.D. in Mechanical Engineering in 2013. He joined Arconic Technology Center in 2013 where he has continued to work since. Parikshit's area of research has been manufacturing process modeling, control, optimization and data analytics. His recent interests of research has been in area of data analytics for manufacturing processes, schedule optimization using MILP methods and model based process monitoring.

KC Morris, National Institute of Standards and Technology

KC Morris leads the Information, Modeling and Testing Group in the Engineering Lab at the National Institute of Standards and Technology (NIST). She is a Computer Scientist with extensive expertise in standards supporting manufacturing systems integration. Currently, her work focuses on infusing smart technologies into the manufacturing sector while ensuring that new practices lead to more sustainable manufacturing. This includes identifying and developing techniques for designing, testing, and evaluating smart manufacturing systems and standards. She serves on the executive committee of ASTM International's E60 Committee on Sustainability and is the vice-chair of ASTM E60.13 on Sustainable Manufacturing. Her research focuses on standards for digital methods of characterizing, assessing, and improving the performance of manufacturing systems including reducing the environmental impacts of manufacturing processes. Earlier in her career she was a lead developer of implementation methods for ISO 10303 (a.k.a. STEP) standards for product data definition—the earliest standards for digital manufacturing.

PANELISTS

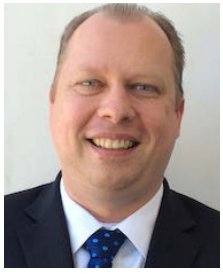
Dr. Brigid Mullany*, National Science Foundation

**Other Appointments: Professor, University of North Carolina at Charlotte*

Brigid Mullany received her Bachelor of Engineering Degree and Doctorate in Mechanical Engineering from University College Dublin in Ireland. Upon graduation she received a two-year EU Marie Curie postdoctoral research position at Carl Zeiss in Germany. In 2004 she joined the Department of Mechanical Engineering and Engineering Science at the University of North Carolina at Charlotte where she is a Professor working in the area of surface finishing and advanced manufacturing. She received in the SME Kuo K Wang Outstanding Young Manufacturing Engineer Award in 2007, and the NSF CAREER award in 2008. Currently she is an Associate Program Director in the Advanced Manufacturing Cluster at the National Science Foundation. She is active in CIRP, and is the Vice Chair of the Scientific Technical Committee on Surfaces (STC-S).

Dr. Yayue Pan, University of Illinois at Chicago

Yayue Pan is an Assistant Professor in the Department of Mechanical and Industrial Engineering at the University of Illinois at Chicago (UIC). She received her doctorate degree in industrial and systems engineering from the University of Southern California in 2014, master's degree in mechanical engineering from Zhejiang University in China in 2010 and bachelor's degree in industrial engineering from Zhejiang University of Technology in China in 2007. In 2013, she worked as a Research Engineer for 3D Systems in Valencia, California, and then joined UIC in 2014. Her current work at UIC investigates multi-material and multi-functional Additive Manufacturing processes and applications, stereolithography process and machine design for fabricating structures with wide solid cross-sections, and rapid prototyping of phase change materials for thermal energy storage applications. Pan received several awards including Best Paper Award in 40th MSEC conference, Outstanding Paper Award in 41st SME NAMRC conference, Honorable Mention Paper Award in 8th International Conference on Micromanufacturing, 2017 SME Outstanding Young Manufacturing Engineer Award, and 2017 University of Illinois at Chicago, College of Engineering Faculty Research Award.

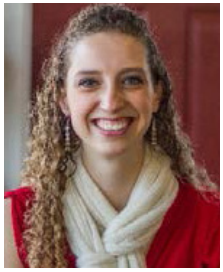


Dr. Frank Pfefferkorn, University of Wisconsin-Madison

Dr. Frank Pfefferkorn is currently an Associate Professor in the Dept. of Mechanical Engineering and Director of the Manufacturing Systems Engineering Program at the University of Wisconsin-Madison. He received his B.S. in Mechanical Engineering from the University of Illinois Urbana-Champaign in 1994. Frank's M.S. and Ph.D. degrees were awarded in 1997 and 2002, respectively, from Purdue University. He then completed a short 6-month postdoc at Purdue before joining the University of Wisconsin-Madison in the summer of 2003. His research goal is to build a scientific understanding of advanced manufacturing processes, develop physics-based models that can be used to improve and control these processes, and to transfer this fundamental knowledge to industry. Frank conducts research that is focused on discrete metal part manufacturing processes. One can say that his focus is where the tool meets the workpiece: which can be a laser, mechanical cutting tool, or friction stir tool. Currently, Dr. Pfefferkorn's laboratory is conducting research on: functionalization (e.g., polishing, structuring, hardening) of metal alloy surfaces by mass-neutral laser remelting, friction stir welding and processing, instrumenting cutting tools for smart manufacturing, and additive-subtractive manufacturing. The U.S. National Science Foundation, U.S. Office of Naval Research, U.S. Department of Energy, the State of Wisconsin, and industrial collaborators have funded his research. Dr. Pfefferkorn is an Associate Member of the International Academy of Production Engineering (CIRP), is a recipient of the 2007 Kuo K. Wang Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers, and is a recipient of a Machine Tool Technology Research Foundation (MTTRF) equipment loan award. From September 2015 through August 2016, Frank served as the Assistant Director for Research Partnerships in the Advanced Manufacturing National Program Office located at the National Institute of Standards and Technology in Gaithersburg, Maryland.

Dr. Ala Qattawi, University of California, Merced

Ala Qattawi is an assistant professor in the Department of Mechanical Engineering at the University of California Merced. She earned her doctorate from Clemson University in 2012. Prior to joining the University of California Merced in 2015, Qattawi was a postdoctoral fellow at the International Center for Automotive Research at Clemson University. She is a recipient of the Hellman Faculty Award for the year 2016 and was named one of the emerging scholars by The Diverse: Issues in Higher Education Magazine. In 2017, she received the outstanding advisor award from University of California Merced and received the outstanding young manufacturing award from SME in 2018. Qattawi's research focuses on design-for-manufacturing for novel manufacturing processes for sheet metal to reduce machinery and energy needs. Her work focuses on origami folded structures by considering material thickness and manufacturing requirements when optimizing metal parts. She developed a flattening procedure that includes manufacturing indices optimization for automotive vehicle structures to be manufactured by Origami folding.

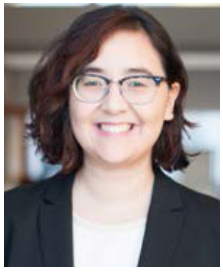


Jessica Sampson, MSME, Orthofix Inc.

Jessica Sampson is a Manufacturing Engineer for Orthofix, Inc, a medical device company with 4 specializations: Spinal implants, Bone growth stimulators, Orthopaedic and external fixators as well as Biological tissue. Jessica (or Ms. Sampson) has been with Orthofix for over 7 years and has worked in all specialties in either design or manufacturing engineering roles. She facilitates Design for Manufacturability reviews with machine shops, process improvements utilizing Lean manufacturing and is also the Administrator for Agile, the Project Life Management (PLM) software. She has been a member of ASME for 10+ years and has served in many positions in her local ASME chapter in college as well as on the International ASME committees. She received her BSME and MSME from the University of Idaho in Moscow, ID with an emphasis toward biomechanics. She competed in many projects within ASME, such as the RC Baja car, during her time at Idaho.

Dr. Mike Vogler, Caterpillar Inc.

Mike Vogler is an Engineering Technical Steward at Caterpillar, focusing on machining technologies and processes. Since joining Caterpillar in 2006, Mike has progressed through several roles as a research engineer, a technical team lead, manager of a manufacturing engineering and metrology support organization, and a program manager for an enterprise manufacturing and supply chain technology thrust area. Prior to joining Caterpillar, he also worked for Delphi developing material removal process simulation tools in the Machining and Manufacturing Systems group. Mike received his PhD from the University of Illinois, Urbana-Champaign, in 2003. He has co-authored seven technical papers, has received one U.S. Patent, and has been active in the Peoria Chapter of SME as Chapter Chair and Chair of the Professional Development committee.



Sarah Wolff *, Northwestern University

** Upcoming Appointments: Argonne National Lab (Post-doc), Texas A&M University (Assistant Professor)*

Sarah Wolff is finishing up her PhD in mechanical engineering from the Advanced Manufacturing Processes Laboratory with Professors Jian Cao and Kornel Ehmann at Northwestern University. After completing a B.S. degree in environmental engineering at Northwestern and working in the aerospace industry, she transitioned to research sustainable manufacturing systems and later advanced processes. Sarah studies the underlying physics of laser-material interactions in both subtractive and additive processes and their influence on resulting microstructure and mechanical behavior. Throughout graduate school, Sarah was service chair in Graduate Women Across Northwestern (GWAN) and was involved in community and educational outreach. Sarah will join Texas A&M as an assistant professor in Department of Industrial Systems and Engineering after a post-doctoral fellowship at Argonne National Laboratory.

0910-1040 401	**Session 1-1-2 - Quality Assurance in Additive Manufacturing Systems: Data Analytics** *Session Chair: Alaa Elwany | Session Co-Chair: Chi Zhou, Shing Chang*	
MSEC2018-6477	Farhad Imani, Aniruddha Gaikwad, Mohammad Montazeri, Prahalada Rao, Hui Yang, Edward Reutzel	Layerwise In-process Quality Monitoring in Laser Powder Bed
MSEC2018-6332	Mohammadhossein Amini, Shing Chang	Process Monitoring Of 3D Metal Printing In Industrial Scale
MSEC2018-6470	Mohammad Montazeri, Reza Yavari, Prahalada Rao, Paul Boulware	In-Process Monitoring of Material Cross-Contamination in Laser Powder Bed Fusion
0910-1040 403	**Session 1-3-2 - Advances in Micro- and Nano-Additive Manufacturing - II** *Session Chair: Ping Guo | Session Co-Chair: Soheil Daryadel*	
MSEC2018-6451	Hongbo Lan, Guangming Zhang, Qian Lei, Jiawei Zhao, Shuting Zou	A Novel Microscale 3D Printing Based On Electric-Field-Driven Jet Deposition
MSEC2018-6552	Soheil Daryadel, Ali Behroozfar, Seyedreza Morsali, Rodrigo Bernal, Majid Minary	Additive Manufacturing of Metals at Micro/Nanoscale by Localized Pulsed Electrodeposition: Nanotwinned Copper Nanowires
MSEC2018-6609	Xiangyu You, Ping Guo	Active Control of Fabricating Nanofibrous Wavy/Helical Arrays Using Near-Field Electrospinning
0910-1040 405	**Session 2-2-3 - Advances in Cyber Physical Systems, Stochastic Modeling, and Sensor Networks in Ad-vanced Manufacturing - III** *Session Chair: Parikshit Mehta | Session Co-Chair: Hui Yang*	
MSEC2018-6622	Longchao Zhao, Satyandra Gupta	Design, Manufacturing, and Characterization of a Pneumatically-Actuated Soft Hand
MSEC2018-6626	Rishi K. Malhan, Yash Shahapurkar, Ariyan M. Kabir, Brual Shah, Satyandra Gupta	Integrating Impedance Control and Learning Based Search Scheme for Robotic Assemblies under Uncertainty
MSEC2018-6646	Sam E. Calisch, Neil A. Gershenfeld	Towards Continuous Production of Shaped Honeycombs

0910-1040 G102	**Session 2-3-3 - Advancing Monitoring, Diagnostics, and Prognostics to Enhance Control** *Session Chair: Timothy Sprock | Session Co-Chair: Brian Weiss*	
MSEC2018-6461	Jing Zou, Qing Chang, Jorge Arinez, Xinyan Ou	Analysis of Production System Real-time Dynamics and Downtime Transient Impact on System Future Production
MSEC2018-6545	Jiantao Lu, Wei Cheng, Yapeng Chu, Jianhong Chen, Yanyang Zi	A Novel Underdetermined Blind Source Separation and Its Application TO Source Contribution Quantitative Estimation
MSEC2018-6638	Peng Wang, Ruqiang Yan, Robert Gao	Multi-mode Particle Filter for Bearing Remaining Life Prediction
0910-1040 Burkhardt	**Session 3-2-2 - Advances in Nontraditional Manufacturing Processes - II** *Session Chair: Bingbing Li*	
MSEC2018-6537	Susmita Datta, Mohammad Shahid Raza, Partha Saha, Dilip Kumar Pratihar	Effects of Line Energy On Mechanical Properties, Corrosion And Shape Memory Behavior of Laser-Welded NiTinol Joints
MSEC2018-6591	Mohammad Shahid Raza, Talari Srinu, Susmita Datta, Partha Saha	Investigating The Effect Of Process Parameters And Scan Strategy During Laser Forming of Thin Open Celled Aluminium Foam
MSEC2018-6699	Mingsan Xu, Kerstern Malama, Bingbing Li	Influence of Curvature Radius of 40Cr on Mechanical Properties of Laser Cladding Layer
0910-1040 407	**Session 3-5-3 - Machining - II** *Session Chair: Sagil James | Session Co-Chair: Meng Zhang*	
MSEC2018-6599	Dinh Nguyen, Patrick Kwon, Pil-Ho Lee, Yang Guo, Kyung-Hee Park	Performance Evaluation Of Minimum Quantity Lubrication With Exfoliated Graphite Nanoplatelets In Turning Titanium Alloy
MSEC2018-6600	Mingman Sun, Yang Yang, Meng Zhang	A Temperature Model for Synchronized Ultrasonic Torrefaction and Pelleting of Biomass for Bioenergy Production
MSEC2018-6314	Sumedh Ghogare, Sanjay Shriram Pande	Efficient Cnc Tool Path Planning Using Point Cloud

0910-1040 G103	**Session 3-6-1 - Machine Control for High Quality Multi-axis Machining** *Session Chair: Keiichi Shirase*	
MSEC2018-6384	Soichi Ibaraki, Shunsuke Goto, Keisuke Tsuboi, Naoto Saito, Noriaki Kojima	Contribution of Five-axis Machine Geometric Errors and Workpiece Setup Errors to On-machine Laser Scanning Measurement
MSEC2018-6517	Ryuta Sato, Keiichi Shirase, Yukitoshi Ihara	Influence of NC Program Quality and Geometric Errors onto S-shape Machining Accuracy
MSEC2018-6557	Kiichi Morishita, Ryuta Sato, Keiichi Shirase, Isamu Nishida	Enhancement of Motion Accuracy for Cone-Frustum Cutting Motion by Modified NC Program
0910-1040 101	**Session 3-7-1 - Microscale Material Processing** *Session Chair: Bruno Azeredo | Session Co-Chair: Martin Byung-Guk Jun*	
MSEC2018-6687	Chuang Qu, Edward Kinzel	Mask-Based Microsphere Photolithography
MSEC2018-6665	Stanislau Niauzorau, Placid Ferreira, Bruno Azeredo	Synthesis of porous nobel metal films with tunable porosity via timed dealloying
MSEC2018-6556	Hang-Eun Joe, Yonghyun Cho, Farid Ahmed, Huitaek Yun, Patrick Lee, Martin Byung-Guk Jun	Characterization of Long Period Grating With A Screw Shape Fabricated by a Single-Path Scanning of Femtosecond Laser
0910-1040 G101	**Session 5-1-4 - Additive Manufacturing and 3D Printing** *Session Chair: Roland Chen | Session Co-Chair: Yancheng Wang*	
MSEC2018-6485	Dai Xue, Yancheng Wang, Deqing Mei, Yue Wang	Development of a multi-step exposure method for projection-based printing system
MSEC2018-6614	Ilhan Yu, Samantha Grindrod, Roland Chen	Fabrication of Gellan Gum Tubular Structure Using Coaxial Needles: A Study On Wall Thickness and Encapsulation
MSEC2018-6719	Dian-Ru Li, Xiao-Qing Tian, Hongjun Wang, Jeffrey Plott, Albert Shih	Five-axis Extrusion-based Additive Manufacturing of Silicone 3D Contour Nonwoven Fabrics

1100-1230 103	**Session 1-4-2 - Symposium Invited Speaker: 3D Printing Technology and Its Biomedical Applications** ***Session Chair: Arif Malik | Session Co-Chair: Robert Chang, Roland Chen***	
MSEC2018-6819	Dong-woo Cho	3D Printing Technology and Its Biomedical Applications
1100-1230 403	**Session 1-5-1 - Design for Manufacturability for Additive Manufacturing - I** ***Session Chair: Mohamed Gadalla***	
MSEC2018-6450	Yafeng Han, Wen F. Lu	Optimization Design of Nonuniform Cellular Structures for Additive Manufacturing
MSEC2018-6578	Mohamed Seif	Failure Analysis and Quality Assessment of 3D Printed ABS Parts
1100-1230 407	**Session 3-5-4 - Manufacturing Process - II** ***Session Chair: Jianfeng Ma | Session Co-Chair: Zhipeng Pan***	
MSEC2018-6309	Alireza Shirazi, Ahmad Varvani, HUA LU	Hybrid Analytical and Experimental Method for Characterization of Thin Multilayer Bonded Structures Subject to Thermal Loading
MSEC2018-6356	Sagil James, Shripal Bhavsar	Finite Element Analysis and Simulation of Ultrasonic Powder Consolidation Process
MSEC2018-6469	Sagil James, Prashanth Rajanna	Molecular Dynamics Simulation Study of Ultrasonic Powder Consolidation Process
1100-1230 G103	**Session 4-2-3 - Laser Welding of Dissimilar Materials** ***Session Chair: Wenda Tan | Session Co-Chair: Yongbing Li***	
MSEC2018-6310	Pascal Schmalen, Peter Plapper	Spectroscopic studies of dissimilar Al-Cu laser welding
MSEC2018-6640	Wenda Tan, Wenkang Huang	Numerical Modeling of Thermo-Fluid Flow and Metal Mixing in Laser Keyhole Welding of Dissimilar Metals

1100-1230 101	**Session 4-6-1 - Advances in Composites Manufacturing Processes** ***Session Chair: Johnson Samuel | Session Co-Chair: Daniel F. Walczyk***	
MSEC2018-6447	Thomas Mennecart, Nooman Ben Khalifa, Henrik Werner, Kay Weidenmann	Developments And Analyses Of Alternative Processes For The Manufacturing Of Fibre Metal Laminates
MSEC2018-6528	Dakai Bian, Jason C. Tsui, Robert R. Kydd, Dong-Jin Shim, Marshall Jones, Y. Lawrence Yao	Interlaminar toughening of fiber reinforced polymers by synergistic modification of resin and fiber
1100-1230 G101	**Session 5-1-2 - Medical Devices and Hard Tissue Cutting** ***Session Chair: Mostafa Bedewy | Session Co-Chair: Yihao Zheng***	
MSEC2018-6340	Jianbo Sui, Naohiko Sugita	Optimization of Drill Bits for Bone Drilling Procedure
MSEC2018-6632	Moataz Abdulhafez, Karim Kadry, Mohamed Zaazoue, Liliana Goumnerova, Mostafa Bedewy	Biomechanical Root-Cause Analysis Of Complications In Head Immobilization Devices For Pediatric Neurosurgery
MSEC2018-6686	Yihao Zheng, JINGXUAN LYU, Yang Liu, Jason Lo, Ata Susamaz, Hitinder Gurm, Albert Shih	Grinding Wheel Motion And Force During Plaque Removal By Rotational Atherectomy In Angulated Coronary Artery
1100-1230 G102	**Session 5-7-2 - Cloud-based Smart Manufacturing - II** ***Session Chair: Rivai Wardhani***	
MSEC2018-6613	Rivai Wardhani, Chao Liu, Khamdi Mubarok, Xun Xu	An Approach To Complete Product Definition Using Step In Cloud Manufacturing
MSEC2018-6531	Zhaorui Dong, Qiong Liu, Qin Li	Optimization of Machining Process Planning for Carbon Reduction
1100-1230 405	**Session 7-3-1 - Manufacturing Public Policy Session 1** ***Session Chair: Shawn Moylan***	
MSEC2018-6489	Jian Cao	Machinery Investment, Not Trade Agreements, are the Problem with Asia
MSEC2018-6738	Thomas Kurfess, Samantha Fijacko	Positions and Advocacy Efforts of the ASME Manufacturing Public Policy Task Force (MPPTF)
MSEC2018-6636	Shawn Moylan	Opinion – Manufacturing Researchers Should Target National Security to Increase Federal Funding in Research and Development

1400-1530 101	**Session 1-2-3 - Advances in Additive Manufacturing Process Design & Part Performance - Process Design III** *Session Chair: Adrian Lutey | Session Co-Chair: Xin Zhao*	
MSEC2018-6651	Wenchao Du, Xiaorui Ren, Yexiao Chen, Chao Ma, Miladin Radovic, Zhijian Pei	Model Guided Mixing of Ceramic Powders with Graded Particle Sizes in Binder Jetting Additive Manufacturing
MSEC2018-6666	Benjamin Graybill, Ming Li, David Malawey, Chao Ma, Juan Manuel Alvarado-Orozco, Enrique Martinez-Franco	Additive Manufacturing Of Nickel-Based Superalloys
MSEC2018-6677	Bret Curtis, Daniel Peters, John Hostetler, Robert Landers, Douglas Bristow, Edward Kinzel	Printing Free-Form Free-Standing Glass Structures
1400-1530 403	**Session 1-4-1 - Advances in 3D Printing of Tissue Scaffolds** *Session Chair: Roland Kaunas*	
MSEC2018-6543	Yingge Zhou, George Tan	Generation Of 3D Nanofiber Structure By Divergence Electrospinning For Tissue Engineering Scaffold
MSEC2018-6567	Qingfu Zhu, Ziyu Zhu, Mei He	3D Additive Manufacturing And Micro-Assembly For Transfection Of 3D-Cultured Cells And Tis-Sues
1400-1530 407	**Session 2-5-2 - Advances in Data Analytics and Engineering Modeling for Intelligent & Resilient Manufacturing Systems - II** *Session Chair: Huanyi Shui | Session Co-Chair: Hui Wang*	
MSEC2018-6678	Xingjian Lai, Huanyi Shui, Jun Ni	A Two-Layer Long Short-Term Memory Network for Bottleneck Prediction in Multi-job Manufacturing Systems
MSEC2018-6691	Zhengqian Jiang, Hui Wang, Qi Tian, Weihong Guo	Co-Design of Supply Chain Network And Subassembly Planning Considering The Reconfiguration of Supply Chain Structure For Factory-In-A-Box Manufacturing
MSEC2018-6370	Di Hu, Gang Chen, Tao Yang, Qianming Chen, Bing Li, Ziwen Wang, Cheng Zhang	An artificial neural network model for monitoring real-time parameters and detecting early warnings in induced draft fan

1400-1530 405	**Session 3-1-1 - Abrasive Machining Processes: Michael P. Hitchiner Memorial Symposium** *Session Chair: Mark Jackson*	
MSEC2018-6592	Gourhari Ghosh, Ajay Sidpara, P. P. Bandyopadhayay	Characterization of Nanofinished WC-Co Coating Using Advanced 3D Surface Texture Parameters
MSEC2018-6615	Zewei Yuan, Kai Cheng, Yan He, Meng Zhang	Investigation on Smoothing Silicon Carbide Wafer with a Combined Method of Mechanical Lapping and Photocatalysis Assisted Chemical Mechanical Polishing

1400-1530 Burkhardt	**Session 3-2-3 - Advances in Nontraditional Manufacturing Processes - III** *Session Chair: Weilong (Ben) Cong*	
MSEC2018-6362	Hui Wang, Fuda Ning, Yingbin Hu, Yuanchen Li, Xinlin Wang, Weilong (Ben) Cong	Edge Trimming of CFRP Composites using Rotary Ultrasonic Machining: Effects of Ultrasonic Vibration
MSEC2018-6631	Palamandadige Fernando, Meng Zhang, Zhijian Pei	Rotary Ultrasonic Machining of CFRP: Effects of Abrasive Properties
MSEC2018-6663	Yingbin Hu, Hui Wang, Yuanchen Li, Fuda Ning, Weilong (Ben) Cong	Surface Grinding of ZTA Parts Fabricated by Laser Engineered Net Shaping Process: Effects of ZrO2 Content and Ultrasonic Vibration

1400-1530 401	**Session 3-5-5 - Machining - III** *Session Chair: Yihao Zheng | Session Co-Chair: Jiunnjyh Wang*	
MSEC2018-6474	Nick Duong, Jianfeng Ma, Shuting Lei	Numerical Investigation of the Damage Evolution in Vibration Assisted Nano Impact Machining by Loose Abrasives with Different Operating Parameters
MSEC2018-6373	Jiunnjyh Wang	The Best and Worst Feed Directions in Milling Chatter
MSEC2018-6551	Samuel Swan, Dinh Nguyen, Jacob Jones, Dae-wook Kim, Patrick Kwon	Tool Wear of Advanced Coated Tools In Drilling of CFRP

1400-1530 G102	**Session 4-1-3 - Advances in Processing and Testing of Polymers and Polymer Nanocomposites** *Session Chair: Fabrizio Quadrini | Session Co-Chair: Jamal Sheikh-Ahmad*	
MSEC2018-6350	Nadia N. Boutros, Ann Chen, Ryan Gan, Yong Gan	Electrohydrodynamic Casting Polymeric Carbon Nanofibers From Different Precursors For The Hyperthermia Application
MSEC2018-6539	Ahmed Korba, Abhishek Kumar, Mark Barkey	A Model for Hyper-Elastic Material Behavior under Thermal Aging with an Application to Natural Rubber
MSEC2018-6415	Denise Bellisario, Fabrizio Quadrini, Loredana Santo, Giovanni Matteo Tedde	Manufacturing Of Antibacterial Additives By Nano-Coating Fragmentation
1400-1530 G103	**Session 4-5-2 - Mechanics of Machining - II** *Session Chair: Christopher Saldana | Session Co-Chair: James Mann*	
MSEC2018-6342	Vandana A.S., Narayan Sundaram	The Microstructural Origin of Sinuous Flow in Metal Cutting
MSEC2018-6682	Jaimeen Patel, Harish Cherukuri	Chip morphology studies using separate fracture toughness values for chip separation and serration in orthogonal machining simulations
MSEC2018-6697	Dinakar Sagapuram, Koushik Viswanathan	Viscous Shear Banding in Cutting of Metals
1500-1700 Concourse	**Session 6-1-2 - Poster Presentation Session - II** *Session Chair: Zhijian Pei | Session Co-Chair: Arif Malik*	
MSEC2018-6735	Shih-Ming Wang, Hariyanto Gunawan, Zhe-Zhi Ye, Chiao-Ping Lin	Development of A New Machine Tool with Co-plane Driving Mechanism
MSEC2018-6736	Changxue Xu, Srikumar Krishnamoorthy	Microgel-assisted biofabrication of 3D vascular-like constructs of interpenetrating network hydrogel
MSEC2018-6741	Yingbin Hu, Hui Wang, Yuanchen Li, Fuda Ning, Weilong (Ben) Cong, Katherine Beskow	Surface Grinding of ZTA Parts Fabricated by Laser Engineered Net Shaping Process: Effects of ZrO2 Content and Ultrasonic Vibration

MSEC2018-6745	Jamie D. Skovron, Laine Mears	Slip-Stick Contact Conditions for the Thermo-Mechanically Coupled Flow Drill Screw Process
MSEC2018-6746	Barbara Linke, Michael Hill, Christopher R D'Elia, Renan Luiz Ribeiro, Destiny Garcia, Jan C. Aurich, Benjamin Kirsch, Daniel Weber	NSF/DFG Collaboration to Understand the Prime Factors Driving Distortion
MSEC2018-6750	Charoula Kousiatza, Alexandros Solomou, Dimitris Lagoudas, Satish Bukkapatnam	3D Printing of Shape Memory Polymer Stent Grafts for Endovascular Repair of the Ascending Aorta
MSEC2018-6751	Chunhui Chung, Ming-Chyun Lee, Chunliang Kuo	On the Diamond-Coated Wire Sawing Process Using Alumina Nanofluidic MQL
MSEC2018-6752	Kuan-Mien Chang, Ming-chyuan Lu, Kuan-Ming Li	Experimental Study of Acoustic Emission Signal for Surface Condition Monitoring in Si-Wafer Micro Milling
MSEC2018-6754	Kohji Suzuki	Evaluations of Mechanical Properties And Internal Imperfections Of Short Carbon Fiber Reinforced Composites For Additive Manufacturing Applications
MSEC2018-6756	Wei Liu, Xiao Li, Yi Pan, Hui Li, Mengde Zhou, Bing Liang, Zhenyuan Jia	Vision-based Wide-range Contouring Error Detection Method for CNC Machine Tools in High Feed Rate
MSEC2018-6758	James Nowak, Aaron Clippinger, Johnson Samuel	Freeform Fabrication of Fiber-Reinforced Hydrogels
MSEC2018-6759	Benjamin Lies, Hantang Qin	Micro Filament Detection of E-Jet Printing Using Machine Vision
MSEC2018-6760	Jennifer Shaffer, Kenneth Maassen, Catheryn Logan, Lonny Thompson, Hongseok Choi, Joshua Bostwick	Automated Ultrasonic Soldering Process with Ceramic Substrates
MSEC2018-6764	Rishi Pahuja, Mamidala Ramulu	Machining characteristics of Discontinuous Fiber Composites
MSEC2018-6770	Alexia Sales, Dongqing Pan, Ethan Terrell, William Russell, John Batson	A Novel Design of an Atomic Layer Deposition System for fast Film Fabrication
MSEC2018-6771	Wei-Yen Lin, Chia Wang, Men Huang, Kuan-Ming Li, Yao-Yang Tsai	Study of Vibration Signals for Tool Wear Condition Monitoring in Micro Milling

MSEC2018-6772	Feng Zhang, Arif Malik, Haoliang Yu	High-Fidelity Roll Profile Contact Modeling By Simplified Mixed Finite Element Method (SM-FEM)
MSEC2018-6773	Ruitong Xiong, Wenxuan Chai, Kaidong Song, Yong Huang	High-Throughput Cell Behavior Evaluation using Laser Printed Constructs
MSEC2018-6774	Yang Yang, Mingman Sun, Meng Zhang	Synchronized Ultrasonic Torrefaction and Pelleting for Bioenergy Manufacturing
MSEC2018-6761	Rufus Chime	Design Innovation In Palm Kernel Cracking Machine
MSEC2018-6653	Abulaiti Maimaitiaili, Ala Qattawi	Investigating the Design and Process Parameters of Folded Perforated Sheet Metal

1550-1720 101	**Session 1-2-4 - Advances in Additive Manufacturing Process Design & Part Performance - Process Design IV** ***Session Chair: Xin Zhao | Session Co-Chair: Alessandro Fortunato***	
MSEC2018-6437	Keiya Ishiyama, Ryo Koike, Yasuhiro Kakinuma, Tetsuya Suzuki, Takanori Mori	Cooling Process For Directional Solidification In Directed Energy Deposition
MSEC2018-6708	Xiangjia Li, Huachao Mao, Yayue Pan, Yong Chen	Mask Video Projection Based Stereolithography With Continuous Resin Flow to Build Digital Models in Minutes
MSEC2018-6634	Tianyu Yu, Austin Breaux, Ming Li, Mukul Atri, Zhichao (Charlie) Li, B. Lynn Ferguson, Chao Ma	Numerical and Experimental Study on Residual Stress and Distortion in Powder Bed Fusion Process

1550-1720 403	**Session 2-1-3 - Process Monitoring and Sensing - I** ***Session Chair: Zhaoyan Fan | Session Co-Chair: Weihong Guo***	
MSEC2018-6354	Christopher Martin, Joseph Kinney, Andrew Matzik, Jessica Molina	DRAFT: Electrical Signatures for Chemical Action at the Work Surface in an Oxyfuel Flame
MSEC2018-6388	Christopher Martin, Todd Batzel	DRAFT: Digital Feed-Forward Control of Gas Mixture with High-Speed Valve Switching
MSEC2018-6580	Y.-Q. Wang, Qi Luo, Haibo Liu, Kuo Liu, Jiakun Wu	A Novel Magnetic Source Design for Flexible Supporting Based on Magnetorheological Fluid

1550-1720 405	**Session 2-4-1 - Advances in Development, Measurement, and Operations Improvement of Complex Manufacturing Systems for Optimized Throughput - I** *Session Chair: Cary Zhang | Session Co-Chair: Herman Tang*	
MSEC2018-6579	Huimin Li, Sitong Xiang, Ming Deng, Mengrui Zhu, Zhengchun Du, Jianguo Yang	Measuring And Modeling Of Volumetric Errors For Vertical Machining Centers Based On Bi-Directional Laser Sequential Step Diagonal Measurement
MSEC2018-6633	Yunyi Kang, Feng Ju	Maintenance Decision Model For A Two-Machine Production Line With Multistage Degradation Machines
MSEC2018-6650	Le Ma, Douglas Bristow, Robert Landers	Characterization of Kinematic Error Model Consistency for Five-Axis Machine Tools
1550-1720 407	**Session 2-6-1 - Intelligent Maintenance Decision Making of Manufacturing Systems - I** *Session Chair: Yisha Xiang | Session Co-Chair: Chen Zhang*	
MSEC2018-6333	Chen Zhang, Wei Gao, Tao Yang, Sheng Guo, Honggang Ding	Effects of power generation on the opportunistic maintenance strategy for wind turbines considering reliability
MSEC2018-6481	Zhicheng Zhu, Yisha Xiang, David Coit	Redundancy Allocation for Serial-parallel System Considering Heterogeneity of Components
1550-1720 Burkhardt	**Session 3-2-4 - Advances in Nontraditional Manufacturing Processes - IV** *Session Chair: Manas Das*	
MSEC2018-6352	Anwesa Barman, Manas Das	Analysis Of Forces During Spot Finishing Of Titanium Alloy Using Novel Tool In Magnetic Field Assisted Finishing Process
MSEC2018-6382	Haojun YANG, Yan Chen, Jiuhua Xu	Evaluation of CFRP Hole Quality in Low Frequency Vibration-assisted Dry Drilling of CFRP/Ti Stacks
MSEC2018-6457	Sagar Sarkar, Ashish Kumar Nath	Water-jet assisted laser surface hardening of medium carbon steel using fiber laser

1550-1720 401	**Session 3-5-6 - Manufacturing Process - III** *Session Chair: Patrick Kwon | Session Co-Chair: Ronghua Meng*	
MSEC2018-6386	Yixuan Feng, Zhipeng Pan, Xiaohong Lu, Steven Liang	Analytical and Numerical Predictions of Machining-induced Residual Stress in Milling of Inconel 718 considering Dynamic Recrystallization
MSEC2018-6416	Yao Liu, Beizhi Li, Yihao Zheng	Investigation Of High-Speed Nanogrinding Mechanism Based On Molecular Dynamics
MSEC2018-6493	Ronghua Meng, Yunqing Rao, Qiang Luo	Optimizing Bi-criteria Permutation Flow Shop Scheduling Problem by Improved NSGA III
1550-1720 G103	**Session 4-2-4 - Friction Stir Seam Welding of Dissimilar Materials** *Session Chair: Yongbing Li | Session Co-Chair: Xun Liu*	
MSEC2018-6363	Xun Liu, Sheng Zhao, Jun Ni	Material Flow Visualization Of Dissimilar Friction Stir Welding Process Using Nano-CT
MSEC2018-6590	Raju Mahto, Surjya K Pal	Friction stir lap welding of thin sheets of AA6061-T6 and AISI304 at different values of pin penetrations
MSEC2018-6711	Fadi Al-Badour, Necar Merah, Omer Mohamed, Abdelaziz Bazoune, Abdelrahman Shuaib	Optimizing Process Conditions In Friction Stir-Diffusion Lap Welding Of Aluminum Alloy With Cold Rolled Steel
1550-1720 G102	**Session 5-5-1 - Sustainability & the Industrial Internet: How data can lead to improved sustainability** *Session Chair: Jing Zou*	
MSEC2018-6331	William Bernstein, David Lechevalier, Don Libes	UMP Builder: Capturing and Exchanging Manufacturing Models for Sustainability
MSEC2018-6707	Arvind Shankar Raman, Karl Haapala, KC Morris	Towards A Standards-Based Methodology For Extending Manufacturing Process Models For Sustainability Assessment

0910-1040 402	**NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 5** *Session Chair: Dean Bartles*	
Paper 11	Edward De Meter, Xie Haochen and Arora Karan	Methodology for Mitigating the Impact of Adhesive Shrinkage for PAAW Technology Applications
Paper 239	Hao Pang, Gracious Ngaile	Development of a Non-isothermal Forging Process for Hollow Power Transmission Shafts
0910-1040 404	**NAMRC - TRACK 3 Additive Manufacturing - Process monitoring 1** *Session Chair: Changxue Xu*	
Paper 159	Subin Shrestha and Kevin Chou	Single track scanning experiment in laser powder bed fusion process
Paper 168	Ho Yeung, Brandon Lane, Alkan Donmez, Jason Fox and Jorge Neira	Implementation of Advanced Laser Control Strategies for Powder Bed Fusion Systems
Paper 194	Timothy R. Simon, Wo Jae Lee, Benjamin E. Spurgeon, Brandon E. Boor, Fu Zhao	An Experimental Study on the Energy Consumption and Emission Profile of Fused Deposition Modeling Process
0910-1040 406	**NAMRC - TRACK 1 Manufacturing Systems - Process analysis 1** *Session Chair: Laine Mears*	
Paper 116	Ketul Patel, Kalaichelvi Venkatesan, Karthikeyan Ramanujam and Sriparvathi Bhattathiri	Modelling and Simulation of Incremental Sheet Metal Forming Process using CNC Machine Tool
Paper 156	Erika Garcia-Lopez, Hector Siller Carrillo and Ciro Rodriguez Gonzalez	Study of the fabrication of AISI 316L microneedle arrays
Paper 193	Injoo Hwang, Zeyi Guan and Xiaochun Li	Scalable manufacturing of Zinc-Tungsten Carbide Nanocomposites

1100-1230 401	NAMRC - TRACK 2 Manufacturing Processes - Tool Wear *Session Chair: Gary Cheng*	
Paper 74	Nandakumar Pillai, Ram Karthikeyan, Sathish Kannan and Vincent Shanthakumar	Effect of Cryogenic treatment on VIKING cold working tool steel and development of wear mechanism maps
Paper 86	Xiaona Luan, Song Zhang, Jianfeng Li, Gamini Mendis, Fu Zhao and John Sutherland	Trade-off analysis of tool wear, machining quality and energy efficiency of alloy cast iron milling process
Paper 98	Ashutosh Khatri and Muhammad Jahan	Investigating tool wear mechanisms in machining of Ti-6Al-4V in flood coolant, dry and MQL conditions

1100-1230 402	NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 1 *Session Chair: Moneer Helu*	
Paper 33	Zhichao Liu, Xinlin Wang, Hoyeol Kim, Yingge Zhou, Weilong Cong and Hong-Chao Zhang	Investigations of Energy Density Effects on Forming Accuracy and Mechanical Properties of Inconel 718 Fabricated by LENS Process
Paper 39	Austin Hayes, Latha Sethuraman, Katherine Dykes and Lee Fingersh	Structural Optimization of a Direct-Drive Wind Turbine Generator Inspired by Additive Manufacturing
Paper 190	Jennifer Bennett, Orion Kafka, Haiguang Lao, Sarah Wolff, Cheng Yu, Puikei Cheng, Gregory Hyatt, Kornel Ehmann and Jian Cao	Cooling rate effect on tensile strength of laser deposited Inconel 718

1100-1230 404	NAMRC - TRACK 3 Additive Manufacturing - Process monitoring 2 *Session Chair: Changxue Xu*	
Paper 160	Ugandhar Delli and Shing Chang	Automated Process Monitoring In 3D Printing Using Supervised Machine Learning
Paper 144	Z.Y. Liu, C. Li, X.Y. Fang and Y.B. Guo	Energy Consumption in Additive Manufacturing of Metal Parts
Paper 226	Ehsan Malekipour, Samuel Attoye and Hazim El-Mounayri	Investigation of Layer Based Thermal Behavior in FDM Process by Infrared Thermography

NAMRC TECHNICAL SESSIONS

1100-1230 406	NAMRC - TRACK 1 Manufacturing Systems - Process analysis 2 *Session Chair: Loredana Santo*	
Paper 20	Hantang Qin, Yi Cai, Benjamin Lies, Kevin Lin and Eric Spahr	Machine vision assisted micro-filament detection for real-time monitoring of electrohydrodynamic inkjet printing
Paper 23	Feidi Dang, Wei Li and Honghan Ye	An efficient constructive heuristic to balance trade-offs between makespan and flowtime in permutation flow shop scheduling
Paper 35	Bopeng Gao, Tianlin Yang, Zhiyong Chang and Neng Wan	A new approach of modelling bottom edge cutting in four-axis roughing of blisk and its application on feedrate optimization

1400-1530 G101	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Case studies 1 *Session Chair: Guoxian Xiao*	
Paper 8	Parikshit Mehta, Christopher Seaman and Sergio Butkewitsch-Choze	Smart Manufacturing Analytics Application for Semi-Continuous Manufacturing Process – A Use Case
Paper 46	Byeongwoo Jeon and Suk-Hwan Suh	Design Considerations and Architecture for Cooperative Smart Factory: MAPE/BD Approach
Paper 97	Atin Angrish, Benjamin Craver, Mahmud Hasan and Binil Starly	A Case Study for Blockchain in Manufacturing: "FabRec": A Prototype for Peer-to-Peer Network of Manufacturing Nodes

1400-1530 402	NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 2 *Session Chair: Moneer Helu*	
Paper 105	Guoying Dong, Yunlong Tang, Dawei Li and Yaoyao Fiona Zhao	Mechanical Properties of Continuous Kevlar Fiber Reinforced Composites Fabricated by Fused Deposition Modeling Process
Paper 128	Yu Dong, Tie-Gang Wang, Bing Yan, Hou-Jun Qi, Yu-Yao Guo and Sha-Sha Xu	Study on the microstructure and mechanical properties of Zr-B-(N) tool coatings prepared by hybrid coating system
Paper 27	Daniel Hutchinson	3D post-printing and its relationship to the advancement of the digital thread for direct digital manufacturing

1400-1530 404	**NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 1** *Session Chair: Shreyes Melkote*	
Paper 47	Rachele Bertolini, Stefania Bruschi and Andrea Ghiotti	Large strain extrusion machining under cryogenic cooling to enhance corrosion resistance of magnesium alloys for biomedical applications
Paper 36	Vigneashwara Pandiyan, Tegoeh Tjahjowidodo, Wahyu Caesarendra and Praveen Gunasekaran	Analysis of Contact Conditions Based on Process Parameters in Abrasive Belt Grinding Using Dynamic Pressure Sensor
Paper 237	Bhaskar Botcha, Vairamuthu Rajagopal, Ramesh Babu N and Satish Bukkapatnam	Process-machine interactions and a multi-sensor fusion approach to predict surface roughness in cylindrical plunge grinding process

1400-1530 406	**NAMRC - TRACK 1 Manufacturing Systems - Process analysis 3** *Session Chair: Jingyan Dong*	
Paper 41	Reza Hamzeh, Ray Y. Zhong and Xun Xu	A Survey Study on Industry 4.0 for New Zealand Manufacturing
Paper 90	Ridvan Aydin, Adam Brown, Fazleena Badurdeen, Wei Li, Keith Rouch and I. S. Jawahir	Quantifying impacts of product return uncertainty on economic and environmental performances of product configuration design
Paper 94	Hong Lu, Yongfei Yang, Wei Fan, Shaojun Wang, Yufu Wang and Yifan Xu	Synchronization precision compensation technology of dual-driving feed mechanism

1550-1720 G101	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Case studies 2** *Session Chair: Guoxian Xiao*	
Paper 188	Neha S. Joshi, Sonali Singh, Matthew Krugh and Laine Mears	Background noise mitigation of dual microphone system for defect detection in electrical cable connection
Paper 200	Ashif Iquebal, Zimo Wang, Woo-Hyun Ko, Zhujiang Wang, P R Kumar, Arun Srinivasa and Satish Bukkapatnam	Towards Realizing Cybermanufacturing Kiosks: Quality Assurance Challenges and Opportunities
Paper 10	Mingtao Wu, Jinwoo Song, Lucas Lin, Noe Aurelle, Yapan Liu, Bingyan Ding, Zhengyi Song and Young Moon	Establishment of Intrusion Detection Testbed for CyberManufacturing Systems

1550-1720 402	**NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 3** *Session Chair: Yong Chen*	
Paper 49	Khaled G. Mostafa, Carlo Montemagno and Ahmed Jawad Qureshi	Strength to cost ratio analysis of FDM Nylon 12 3D Printed Parts
Paper 178	Astrit Imeri, Ismail Fidan, Michael Allen and Garrett Perry	Effect of Fiber Orientation in Fatigue Properties of FRAM Components
Paper 210	Laxmi Poudel, Zhenghui Sha and Wenchao Zhou	Mechanical strength of chunk-based printed parts for cooperative 3D printing

1550-1720 404	**NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 2** *Session Chair: Shreyes Melkote*	
Paper 37	Shiqi Fang, Flavio Soldera, Andreas Rosenkranz, Thomas Herrmann, Dirk Bähre, Luis Llanes and Frank Mücklich	Microstructural and Metallurgical Assessment of the Laser-Patterned Cemented Tungsten Carbide (WC-CoNi)
Paper 54	Shashank Sharma, Vijay Mandal, Janakarajan Ramkumar and Subramanium Anantha Ramakrishna	Numerical simulation of melt pool oscillations and protuberance in pulsed laser micro melting of SS304
Paper 238	V. Ezhilmaran, L. Vijayaraghavan, N. J. Vasa	Nd3+:YAG laser surface processing of moly-chrome film at 1064 nm, 532 nm and 355 nm wavelengths

1550-1720 406	**NAMRC - TRACK 1 Manufacturing Systems - Process analysis 4** *Session Chair: Jingyan Dong*	
Paper 15	Sumit Sood, Ravinder Kumar Duvedi, Sanjeev Bedi and Stephen Mann	3D representation and CNC machining of 2D digital images
Paper 93	Bitao Yao, Zude Zhou, Lihui Wang, Wenjun Xu, Junwei Yan and Quan Liu	A function block based cyber-physical production system for physical human-robot interaction
Paper 133	Changya Yan, Chen-Han Lee, Xiyan Li, Yuming Zhang and Min Kang	A Multi-objective Tool-axis Optimization Algorithm based on Covariant Field Functional

WEDNESDAY, JUNE 20, 2018

THURSDAY, JUNE 21, 2018

TIME	LOCATION	EVENT
07:00 - 18:00	Lobby	Registration/Information
07:00 - 08:00	Legacy Club - 4th Floor	Continental Breakfast
08:00 - 09:00	Main Hall	Keynote - Takeshi Ebisu
09:10 - 10:40		Technical Session 9
09:10 - 10:40	103	RAMP Workshop - Session 1 (NIST Competition Presentations - 1)
10:00 - 17:00	Field Box Concourse	Exhibitor Booths Open
10:40 - 11:00	Field Box Concourse	Break
11:00 - 12:30		Technical Session 10
11:00 - 12:30	103	RAMP Workshop - Session 2 (NIST Competition Presentations - 2, Lightning Talks - 1)
12:00 - 12:30	405	MForesight Presentation - Tom Mahoney
12:30 - 13:50	Main Hall	SME Awards Luncheon & NAMRI Founders Lecture
14:00 - 15:30		Technical Session 11
14:00 - 15:30	103	RAMP Workshop - Session 3 (Lightning Talks - 2, ASTM Schema Refinement)
15:00 - 17:00	Field Box Concourse	Poster Session 3
15:00 - 17:30	Off Site	Lab/Facility Tours A,B,C,D (registration required)
15:30 - 15:50	Field Box Concourse	Break
15:50 - 17:20		Technical Session 12
15:30 - 17:20	103	RAMP Workshop - Session 4 (Brainstorming Future Research Directions)
17:00 - 17:45	Field Box Concourse	Exhibitor Booth Move-out
17:20 - 18:00	Field Box Concourse	RAMP Poster Session & Awards (Best Poster & NIST Competition Winners)
18:00 - 19:30	Main Hall	Conference Banquet

KEYNOTE SPEAKER

Takeshi Ebisu

President & CEO, Goodman Global Group, Inc.

Takeshi Ebisu has been President and Chief Executive Officer of Goodman Global Group, Inc., a member of the Daikin Group since 2014. In addition, he is an associate officer of Daikin Industries, Ltd.

After joining Daikin in 1988, Takeshi has progressively served in several operational and corporate planning leadership roles.

Previously, he led the formation of the medium-term strategic management plans for the Daikin Group worldwide from 2005 to 2014.

Additionally, he was instrumental in the acquisitions of Goodman Manufacturing in 2012 and OYL Industries which included McQuay (currently Daikin Applied) in 2007.

Takeshi, a native of Hyogo, Japan, graduated from Kyoto University and earned an Undergraduate and Master's degree in Nuclear Engineering.

NIST-ASTM-NSF-ASME Workshop on Challenges in Representing Manufacturing Processes for Systemic Sustainability Assessments

Organized by: Karl Haapala (Oregon State University), Barbara Linke (University of California, Davis), Fu Zhao (Purdue University), KC Morris (NIST), William Bernstein (NIST)

Sponsored by: The U.S. National Science Foundation Nanomanufacturing Program

Thursday June 21, 2018, 9:10 a.m. - 6:00 p.m., Texas A&M, Hall of Champions (103)

The goal of this workshop is to engage the research community in discussions around emerging topics in advanced manufacturing, nanomanufacturing, sustainable manufacturing and engineering education. The outcomes of the workshop will help universities and government agencies identify needs for education and research to support characterizing unit manufacturing processes for sustainability assessment, define current limitations in associated education and research practices, and prioritize the challenges to be pursued by the manufacturing research community to best meet industry needs in adopting and applying analytical methods for improving process and system performance. In addition, the workshop will host finalist presentations from the NIST RAMP Competition and poster presentations from NSF-sponsored RAMP Student Travel Awardees.

Agenda (Thursday, June 21, 2018)

09:10-10:40:	Session 1 - Introduction and NIST RAMP Finalist Presentations
11:00-12:30:	Session 2 - NIST RAMP Finalist Presentations and Expert Lightning Talks
14:00-15:30:	Session 3 - Expert Lightning Talks and ASTM Schema Refinement Activity
15:50-17:20:	Session 4 - Brainstorming Future Manufacturing Research Needs at NSF
17:20-18:00:	NIST RAMP Competition Winners and RAMP Workshop Poster Awards

Fee: Free for registered conference participants

Attendance: Encouraged for all registered conference participants, mandatory for NSF-sponsored RAMP Student Travel Awardees

NSF Workshop Chair: Dr. Karl R. Haapala, Associate Professor, School of Mechanical, Industrial and Manufacturing Engineering, Oregon State University, 541.737.3122, Karl.Haapala@oregonstate.edu

NIST RAMP* Competition Chair: Katherine C. Morris, Group Leader, Information Modeling and Testing Group, National Institute of Standards and Technology, 301.975.8286, kcm@nist.gov
*(*RAMP: Reusable Abstractions of Manufacturing Processes)*

LAB / FACILITY TOURS

LAB TOUR A

Engineering Technology Building Manufacturing Lab – This lab combines state-of-the-art advanced manufacturing equipment, including a Powder Bed Fusion Metal AM System: ProX 200™ by 3D Systems; Directed Energy Deposition Metal AM system: LENS MR-7 by Optomec; Hybrid Additive/Subtractive AM System; SLA (Stereolithogprahy) 3D Printer: Form 2 SLA printer from Formlabs; 3D Scanner: High end FastSCAN Cobra handheld 3D laser scanner; Thermal Monitoring Sensors: Both ProX 100 and LENS MR-7 systems; and four Polymer AM Systems.

Zachry Engineering Education Complex and Fischer Design Center – Zachry Engineering Education Complex will be the largest academic building on the Texas A&M campus and unlike any other facility in the nation. With over 525,000 sq. ft. it completely revolutionizes the way we deliver education. The complex includes the state-of-the-art Fischer Design Center that enables students to have access to prototyping tools, equipment, materials and support staff. Through partnerships with industry and nonprofit sponsors, the design center creates an environment where concepts become solutions to real-world problems and student teams come together to build new prototypes, acquire new skills and develop new relationships.

LAB TOUR B

National Center for Therapeutics Manufacturing (NCTM) – The NCTM is an interdisciplinary workforce education and research center serving the global biopharmaceutical and vaccine manufacturing industries. NCTM develops and delivers customizable instructor-led, computer-based and hands-on learning to expose the student to various aspects of cell culture and basic molecular biology, aseptic processes and microbiology, upstream and downstream processing of biological materials, including viruses, monoclonal antibodies and other recombinant proteins, as well as industrial bioanalytical methods.

Materials Characterization Facility (MCF)/Aggie Fab Lab - The MCF is a multi-user shared facility which houses the fabrication and characterization instrumentation essential for the development, understanding and study of new materials and devices. The Aggie Fab Lab is a shared nano/micro fabrication facility with ISO 14644-1 class system ISO 5 and ISO 6 (class 100/1000) cleanroom space.

LAB TOUR C

Turbomachinery Lab (TURBO) – The Turbomachinery Laboratory conducts basic and applied research into important problems of reliability and performance of turbomachinery — rotating machinery that extracts or adds energy to fluids. That's everything from classic Dutch windmills to the space shuttle's main engine turbopumps and compressors that move natural gas through the distribution system.

Low-Speed Wind Tunnel (LSWT) – A large-scale, subsonic wind tunnel with air velocities up to 200 mph achieved in its seven-foot-tall, ten-foot-wide test section. Higher velocities up to Mach 0.4 are possible with a reduced-size test section. Aircraft models with up to a seven-foot wing span can be easily accommodated. The LSWT measurement system can accommodate models that produce up to 3000 pounds of lift and 1000 pounds of drag using its external balance. The LSWT is used extensively for undergraduate education, engineering research and commercial testing. Studies have been conducted on everything from bicycles with riders, golf clubs, light pole fixtures, and offshore oil platforms and drill ships to missiles, airplanes, and space re-entry vehicles.

LAB TOUR D

Center for Infrastructure Renewal (CIR) – A joint initiative of the Texas A&M Transportation Institute and the Texas A&M Engineering Experiment Station. The facility (over 135,500 sq. ft.) includes laboratories to reduce cost and extend infrastructure safety, resiliency and durability, as well as prepare for the introduction of connected and autonomous transportation.

Process Engineering R&D - The Process Engineering R&D Center (formerly the Food Protein R&D Center) has more than 75 years of experience developing new processes focusing on the design, operation, control and optimization of chemical, physical and biological processes for converting diverse agricultural crops and animal products into food, feed and industrial ingredients. Being the only public fully equipped oilseed processing facility in the world, making this facility uniquely positioned to support engineering research and training.

0910-1040 401	**Session 1-1-3 - Quality Assurance in Additive Manufacturing Systems: Process Sensing** *Session Chair: Jarred Heigel | Session Co-Chair: Bo Cheng, Alaa Elwany*	
MSEC2018-6586	Roozbeh (Ross) Salary, Jack Lombardi III, Darshana L. Weerawarne, Mohammad Samie Tootooni, Prahalada Rao, Mark Poliks	In Situ Functional Monitoring of Aerosol Jet Printed Electronic Devices Using a Combined Sparse Classification Approach
MSEC2018-6623	Amol Kulkarni, Mustafa Rifat, Amey Vidvans, Gregory Bicknell, Xi Gong, Guha Manogharan, Janis Terpenny, Saurabh Basu	Scalable Detection of Defects in Additively Manufactured PLA Components
MSEC2018-6487	Jack Lombardi III, Roozbeh (Ross) Salary, Darshana L. Weerawarne, Prahalada Rao, Mark Poliks	In-situ Image-Based Monitoring and Closed-Loop Control of Aerosol Jet Printing
0910-1040 403	**Session 2-10-1 - Advances in Manufacturing, Quality, Reliability, and Continuous Improvement - Part I** *Session Chair: George (Mike) Smith | Session Co-Chair: Herman Tang*	
MSEC2018-6535	Pandeng Zhang, Zhao Liu, Tianfei Zhang, Weiqiang Chen, Ying Lin, Yutian Zhu, Changlong Zheng, Yanbin Lin, Zhengzhong Zheng	Single-Degree-Of-Freedom Dynamic vibration Absorber for Unknown System
MSEC2018-6542	Romina Dastoorian, Ahmad Elhabashy, Wenmeng Tian, Lee Wells, Jaime Camelio	Automated Surface Inspection Using 3D Point Cloud Data in Manufacturing - A Case Study
MSEC2018-6527	Devarajan Ramanujan, William Bernstein	VESPER: Visual Exploration of Similarity and Performance Metrics for Computer-Aided Design Repositories
0910-1040 407	**Session 3-4-2 - Advances in Assisted / Augmented Manufacturing Processes - II** *Session Chair: Farbod Akhavan Niaki | Session Co-Chair: Vyas Mani Sharma*	
MSEC2018-6359	Huawei Song, Junfeng Xiao, Jialun Li, Jinqi Dan, Xiao Chen, Jianfeng Xu	Machining of Fused Silica using Pulsed Laser Heating Assistance
MSEC2018-6565	Honglun Xu, Jianguo Wu, Tzu-Liang (Bill) Tseng	An Efficient Method for Online Identification of Steady State for Multivariate System
MSEC2018-6520	Brandt Ruszkiewicz, Laine Mears	Investigation of the Electroplastic Effect Through Nominally Equal Energy Deformation

0910-1040 G103	**Session 3-6-2 - Machining process on multi-axis machine tool** *Session Chair: Soichi Ibaraki*	
MSEC2018-6564	Isamu Nishida, Takaya Nakamura, Ryuta Sato, Keiichi Shirase	Voxel Based Cutting Force Simulation of Ball End Milling Considering Cutting Edge Around Center Web
MSEC2018-6525	Guoqiang Fu, Hongli Gao, Tengda Gu	A Universal Postprocessor of General Table-tilting Type of Five-axis Machine Tools without Rotational Tool Center Point Function for Actual NC code Generation
0910-1040 G102	**Session 3-7-2 - Non-conventional micromachining and microforming** *Session Chair: Sagil James | Session Co-Chair: Chandra Nath*	
MSEC2018-6490	Yi Shi, Jian Cao, Kornel Ehmann	Dieless Water Jet Incremental Micro-Forming
MSEC2018-6494	Sagil James, Anurag Mahajan	Experimental Study Of Machining Of Smart Materials Using Submerged Abrasive Waterjet Micromachining Process
MSEC2018-6573	Sagil James, Sharadkumar Kakadiya	Experimental Study Of Machining Of Shape Memory Alloys Using Dry Micro Electrical Discharge Machining Process
0910-1040 G101	**Session 5-2-1 - Advancing Biomedicine through Innovative Manufacturing and Materials - I** *Session Chair: Biran Wang | Session Co-Chair: Shiren Wang*	
MSEC2018-6345	Biran Wang, Liming Wang, Shiren Wang	Template-Free Fabrication of Aligned Nanoarray for Quantifying the Nanosurface-Single Cells Interaction
MSEC2018-6582	Rajib Chakraborty, Susmita Datta, Mohammad Shahid Raza, Partha Saha	Improvement of ionic bonding strength and electrochemical corrosion resistance of hydroxyapatite- calcium phosphate pulsed electrochemically deposited in-situ coating through hydroxyl ion treatment
MSEC2018-6611	Yingbin Hu, Shahrima Maharubin, Weilong (Ben) Cong, George Tan	Laser Engineered Net Shaping of Titanium-Silver Alloy for Orthopedic Implant

0910-1040 101	**Session 7-1-1 - Manufacturing USA 1** *Session Chair: Frank Pfefferkorn | Session Co-Chair: Mike Vogler*	
MSEC2018-6322	Roby Lynn, Roberto Leo Medrano, Didier Contis, Tommy Tucker, Thomas Kurfess	Automated Multi-User Analysis of Virtualized Voxel-Based CAM on Shared GPUs
MSEC2018-6399	Cunfu Wang, Xiaoping Qian, Bill Gerstler, Jeff Shubrooks	Bounday Slope Control in Topology Optimization for Additive Manufacturing
MSEC2018-6521	Lang Yuan, Sam Anand, Santanu Chaudhuri, Susan Moehring, Pinghai Yang, Tyler Nelson, Archak Goel, Omkar Ghalsasi, Botao Zhang, Brian Mercer, Pikee Priya, Dan Scherrer, Rob Criger, Radu Pavel, Charlie Tokowitz	Multidisciplinary Virtual Toolset for Laser Powder-bed Fusion Additive Manufacturing (PBFAM) and Multi-Step Post Processing Certification

0910-1040 103	**Session 10-1-1 - RAMP Workshop Session 1** *Session Chair: Karl Haapala | Session Co-Chairs: KC Morris, Barbara Linke, Bill Bernstein*	
Finalist Presentation	Ian Garretson, Barbara Linke	A Production Line for Polylactide Business Card Holders
Finalist Presentation	Timothy Simon, Yiran Yang, Wo Jae Lee, Jing Zhao, Lin Li, Fu Zhao	Sustainability Analysis of Stereolithography using UMP Models
Finalist Presentation	Sriram Manoharan, Dustin Harper	Aggregating Unit Manufacturing Process Models to Enable Environmental Impact Characterization of Polymer-Based Hybrid Manufacturing
Finalist Presentation	Feng Ju, Daniel McCarville, Hashem Alshakhs, Weihao Huang, Xuefeng Dong, Hussain Alhader	UMP Model for Flexible Manufacturing System

1100-1230 401	**Session 1-2-5 - Advances in Additive Manufacturing Process Design & Part Performance - Materials I** *Session Chair: Xin Zhao | Session Co-Chair: Alessandro Fortunato*	
MSEC2018-6418	Sagar Sarkar, Soumya Dubey, Ashish Kumar Nath	Effect of Heat Treatment on Impact Toughness of Selective Laser Melted Stainless Steel Parts
MSEC2018-6429	Sagar Sarkar, Saumya Ranjan Jha, Ashish Kumar Nath	Effect of Heat Treatment on Corrosion properties of Selective Laser Melted Stainless Steel Parts
MSEC2018-6421	Sagar Sarkar, Ankit Porwal, Yaswanth Nuthalapati, Ashish Kumar Nath	A Study on Effect of Different Process Parameters on the Quality of Overhang Surface Produced by Selective Laser Melting

1100-1230 405	**Session 3-2-5 - Advances in Nontraditional Manufacturing Processes - V** *Session Chair: Muhammad Jahan*	
MSEC2018-6442	Benjamin Jenett, Neil A. Gershenfeld, Paul Guerrier	Building Block-Based Assembly of Scalable Metallic Lattices
MSEC2018-6585	Xi Zhang, Chunying SI, Yuanyuan Shi	Feasibility Study Of On-Machine Inspection Of Micro Milling Cutter Runout
	Tom Mahoney	MForesight Presentation
1100-1230 G102	**Session 3-5-7 - Machining - IV** *Session Chair: Alireza Shirazi | Session Co-Chair: John Miers*	
MSEC2018-6504	Sagil James, Vivek Anand Menon, Mayur Parmar	Molecular Dynamics Simulation Study Of Liquid-Assisted Laser Beam Machining Process
MSEC2018-6505	Kai Guo, Bin Yang, Jie Sun, Vinothkumar Shivalingam	Investigation On the Tool Wear Model And Equivalent Tool Life In End Milling Titanium Alloy Ti6Al4V
MSEC2018-6516	Yun Chen, Liang HOU, Huaizhong Li, Xiangjian Bu	Prediction of chatter stability in end milling using a time domain simulation approach
1100-1230 407	**Session 3-7-3 - Mechanical machining** *Session Chair: Hyung Wook Park | Session Co-Chair: Xiaohong Lu*	
MSEC2018-6311	Zhengyang Kang, Martin Byung-Guk Jun, Yonghong Fu	Performance of Cemented Carbide Cutting Tools with Volcano-Like Texture on Rake Face
MSEC2018-6378	Xiaohong Lu, Xinxin Wang, Jing Sun, Hong Zhang, Yixuan Feng	The influence factors and prediction of curve surface roughness in micro-milling nickel-based superalloy
MSEC2018-6570	A Sravan Kumar, Sankha Deb, Soumitra Paul	A Study on Micro-Milling of Aluminium 6061 and Copper with Respect to Cutting Forces, Surface Roughness and Burr Formation

1100-1230 403	**Session 4-2-2 - Friction Based Spot Joining & Laser Welding Processes** ***Session Chair: Xun Liu | Session Co-Chair: Xin Zhao***	
MSEC2018-6452	YunWu Ma, GuanZhong He, Ming Lou, Yongbing Li, ZhongQin Lin	Effects of Process Parameters on Crack Inhibition and Mechanical Interlocking in Friction Self-piercing Riveting Aluminum Alloy and Magnesium Alloy
MSEC2018-6692	Ankit Varma, Saheem Absar, Jamie D. Skovron, Brandt Ruszkiewicz, Tim Abke, Laine Mears, Hongseok Choi, Xin Zhao	Thermal-Mechanical Numerical Modeling of the Friction Element Welding Process
MSEC2018-6584	Angshuman Chattopadhyay, Muvvala Gopinath, Ashish Kumar Nath, Vikranth Racherla	A Study on Laser Welding of titanium and Stainless Steel
1100-1230 G103	**Session 4-2-5 - Special Applications of Joining Technologies for Dissimilar Materials** ***Session Chair: Wayne Cai | Session Co-Chair: Wenda Tan***	
MSEC2018-6434	Hongliang Li, Duo Liu, Zhi Wang, Ning Guo, Jicai Feng	An Analysis of Microstructure and Microhardness Distribution in Underwater Wet Welding of 304L Austenitic Stainless Steel to Low Alloy Steel 16Mn
MSEC2018-6627	Denzel Bridges, Ying Ma, Christopher Rouleau, Zachary Gosser, Kunlun Hong, Jinquan Cheng, Zhili Zhang, Cary Smith, Yoseph Bar-Cohen, Anming Hu	Preparation of Thick Ni/Al Reactive Multilayer films and Prospective Use for Self-Powered Brazing of Ti-6Al-4V
MSEC2018-6729	Navneet Arora, Rahul Chhibber, Bijan K Dutta	Residual Stresses In Bimetallic Weld Joint With Varying Buttering Layer Thickness
1100-1230 G101	**Session 5-2-2 - Advancing Biomedicine through Innovative Manufacturing and Materials - II** ***Session Chair: Robert Chang***	
MSEC2018-6675	Houzhu Ding, Robert Chang	Bioprinting of Liquid Hydrogel Precursors in a Support Bath by Analyzing Two Key Features: Cell Distribution and Shape Fidelity
MSEC2018-6313	Liang Ma, Bin Zhang, Changchun Zhou, Lei Gao, Yichen Luo, JinGyu Ock, Wei Li, Huayong Yang	Flow Analysis of a Porous Polymer-Based Three-dimensional Cell Culture Device for Drug Screening

1100-1230 101	**Session 7-1-2 - Manufacturing USA 2** *Session Chair: Shreyes Melkote | Session Co-Chair: Mike Vogler*	
MSEC2018-6458	Yang Liu, Lei Chen, Suhong Zhang, Michael Eller, Grant Kruger, Zhili Feng, Albert Shih	Experimental Study and Finite Element Method Thermal Modeling of Friction Stir Back Extrusion of 6063 Aluminum Alloy
MSEC2018-6596	Kyung Chung, Don Hashiguchi, Conrad Park, Erica Bindas, Ji Xie, Matthew Willard, John J. Lewandowski	Manufacturing Processes and Properties of Mechanically Alloyed Al-SiC Metal Matrix Composite
MSEC2018-6601	Samantha Reese, Timothy Remo, Margaret Mann, Kelsey Horowitz	Regional Manufacturing Cost Structures and Supply Chain considerations for Medium Voltage Silicon Carbide Powder Applications
1100-1230 103	**Session 10-1-2 - RAMP Workshop Session 2** *Session Chair: Karl Haapala | Session Co-Chairs: KC Morris, Barbara Linke, Bill Bernstein*	
Finalist Presentation	Zhaoyan Fan, Sai Srinivas Desabathina	Data Driven Unit Manufacturing Process (UMP) Model for Monitoring Specific Energy in Surface Grinding Process
Finalist Presentation	Justin Canaperi, Yongxin (Jack) Guo, John Park, Jun (Albert) Yang, Yuki Yoshinaga	Grinding Analysis & Model
Lightning Talk	Karl Haapala (Moderator/Oregon State), Khershed Cooper (NSF), Kevin Lyons (NIST), Ajay Malshe (U Arkansas), Barbara Linke (UC Davis)	Advanced Manufacturing Research Challenges & Opportunities
1400-1530 401	**Session 1-2-6 - Advances in Additive Manufacturing Process Design & Part Performance - Materials II** *Session Chair: Alessandro Ascari | Session Co-Chair: Adrian Lutey*	
MSEC2018-6500	Sumair Sunny, Saman Rostami, Arif Malik	Effects of Fluid Cavity modeling When Predicting compressive Strength of FDM Printed Nylon with Varying Infill Pattern and Density
MSEC2018-6701	Peiying Bian, Jing Shi, Xiaodong Shao, Jingli Du, Jun Dai, Kewei Xu	An investigation on Residual Stress in 316L Stainless Steel by Selective Laser Melting
MSEC2018-6681	Truong Do, Tyler Bauder, Kristian Rego, Hawke Suen, Junghoon Yeom, Patrick Kwon	Additively manufactured Full-Density Stainless Steel 316L with Binder Jet Printing

1400-1530 403	**Session 2-3-4 - Emerging Capabilities to Enhance Monitoring, Diagnostics, and Prognostics** *Session Chair: Thurston Sexton | Session Co-Chairs: Brian Weiss, Chandra Nath*	
MSEC2018-6463	Chabum Lee	Precision Cutting Tool Wear Monitoring Method by Knife-Edge Diffraction Interferometry
MSEC2018-6513	Dazhong Wu, Changxue Xu, Srikumar Krishnamoorthy	Predictive Modeling of Droplet Velocity and Size in Inkjet-Based Bioprinting
MSEC2018-6641	Rakshith Badarinath, Kai-Wen Tien, Vittaldas Prabhu	Unified Control of Production, Capacity, and pre-emptive Maintenance of Fused Filament Fabrication Process
1400-1530 407	**Session 2-10-2 - Advances in Quality, Reliability, and Continuous Improvement- Part II** *Session Chair: Herman Tang | Session Co-Chair: George (Mike) Smith*	
MSEC2018-6572	Md Fashiar Rahman, Jianguo Wu, Tzu-Liang (Bill) Tseng	Automated Fiber Extraction from SEM Images with Application to Quality Control of Fiber-reinforced Composites Manufacturing
MSEC2018-6725	Jiasheng Li, Yang Jiao, Pinkuan Liu	Modeling for prediction of surface roughness and experimental research in ultra-precision flycutting machining
MSEC2018-6316	Li Yangfan, Zhang Yingjie, Dai Bochao, Zhang Lin	Dynamic Importance Analysis of Components of Complex Mechanical System by Small sample data
1400-1530 G102	**Session 3-5-8 - Machining - V** *Session Chair: Feng Zhang | Session Co-Chair: Steven Becker*	
MSEC2018-6541	Steven Becker, Hendrik Hotz, Benjamin Kirsch, Jan C. Aurich, Erik von Harbou, Ralf Müller	A Finite Element Approach To Calculate Temperatures arising During Cryogenic Turning Of Metastable Austenitic Steel AISI 347
MSEC2018-6576	Dinesh Setti, Benjamin Kirsch, Peter A. Arrabiyeh, Jan C. Aurich	Visualization of Geometrical Deviations in Micro Grinding by Kinematic Simulations
MSEC2018-6498	Xingbang Chen, Ashutosh Khatri, Jianfeng Ma, Muhammad Jahan	Numerical Investigation of the slot up milling of Ti-6Al-4V

1400-1530 G101	**Session 4-1-4 - Advances in Pre-treatment and Post-processing Analysis of Polymers** *Session Chair: Loredana Santo | Session Co-Chair: Catalin Fetecau*	
MSEC2018-6532	Catalin Fetecau, Felicia Stan, Petru Timotin, Nicoleta V. Stanciu, Razvan T. Rosculet	Mechanical Behavior of LDPE/MWCNT Composites after Fatigue and Cryogenic Treatment
MSEC2018-6512	Nestor Vasquez, Tim Sabo, Teresa Brugarolas, Adam Smith	Polyurethane curing Optimization based NCO Measurements
MSEC2018-6656	Yang Yang, Timothy Deines, Meng Zhang, Ke Zhang, Donghai Wang	Supercritical CO2 Pretreatment of Cellulosic Biomass for Biofuel Production: Effects of Biomass Particle Size
1400-1530 G103	**Session 4-5-3 - Mechanics of Forming** *Session Chair: Harish Cherukuri | Session Co-Chair: Christopher Saldana*	
MSEC2018-6349	Rickmer Meya, Christian Löbbe, A. Erman Tekkaya	Stress State Control By A Novel Bending Process And Its Effect On Damage Evolution
MSEC2018-6574	Baran Güler, Mert Efe	Multi-Scale Characterization of Deformation in Aluminum
MSEC2018-6612	Justin Milner, Thomas Gnäupel-Herold	Design of an Octo-Strain Specimen for Biaxial Tension Testing
1400-1530 101	**Session 7-1-3 - Panel: Advanced Robotics for Manufacturing** *Session Chair: Prabhakar R. Pagilla | Session Co-Chair: Bob Grabowski* *Panelists: Steve Turek (DoD), Bob Grabowski (ARM Institute), Prabhakar Pagilla (TAMU), ARM Industry Member Representative*	
1400-1530 103	**Session 10-1-3 - RAMP Workshop Session 3** *Session Chair: Karl Haapala | Session Co-Chairs: KC Morris, Barbara Linke, Bill Bernstein*	
Lightning Talk	Janet Twomey, Barbara Linke	Unit Process Modeling for Life Cycle Inventories
Lightning Talk	Arvind Shankar Raman, KC Morris, Karl Haapala	Reusable, Extensible, & Composable Unit Manufacturing Process Models
Lightning Talk	Alex Brodsky	Factory Optima: Web-based Manufacturing System Analysis
Workshop Activity	William Bernstein	Unit Manufacturing Process Modeling Schema Refinement

1500-1700 Concourse	Session 6-1-3 - Poster Presentation Session - III *Session Chair: Zhijian Pei | Session Co-Chair: Arif Malik*	
MSEC2018-6779	Bing Yao, Farhad Imani, Edward Reutzel, Hui Yang	Markov Decision Process for Sequential Optimization of Additive Manufacturing
MSEC2018-6780	Yuan Yue, Swarn Jha, Hong Liang	Fabrication of Hierarchical Micro-structures as Novel Electrodes for Electrochemical Energy Storage
MSEC2018-6781	Ye Zhu, Lianpo Wang, Yonggang Gu, Chao Zhai, Jun Ni, Baoyang Jiang	A Laser Triangulation-based 3D Measurement System for Inner Surface of Deep Holes
MSEC2018-6782	Ming Li, Chao Ma, Alex Fang, Zhijian Pei	Additive Manufacturing of Nanoparticles Reinforced Metals
MSEC2018-6784	Sumair Sunny, Saman Rostami, Arif Malik	Effects of Internal Fluid Cavity Modelling in FDM Printed Nylon Strucutres
MSEC2018-6785	Gan Feng, Dinakar Sagapuram	Plastic flow in cutting of metals at small length scales
MSEC2018-6786	Mohammad Hatamleh, Sepehr Sadeh, Tayyub Farooq, Arif Malik, Dong Qian	Simulation of Laser Peening on Selective Laser melted A357 Aluminum Alloy
MSEC2018-6787	Palamandadige Fernando, Meng Zhang, Zhijian Pei	Rotary Ultrasonic Machining of Rocks: Effects of Machining Variables on Cutting Force
MSEC2018-6788	Pandeng Zhang, Zhao Liu	Single-degree-of-freedom Dynamic Vibration Absorber for Unknown System
MSEC2018-6789	Wenhu Xu, Lian Ma, Yan Chen, Hong Liang	Electrochemical Mechanical Polishing of Cobalt
MSEC2018-6790	Lian Ma, Xihua He, Alex Fang, Hong Liang	Evaluation of Electroless-Plated Ni-P Coatings on Diamond Abrasives
MSEC2018-6791	JuEun Lee, Seon Jeong Huh, Hee Joon Lee	Experimental Determination of thermal Conductivity of Cortical Bone with Heat Loss Estimation
MSEC2018-6792	Nikolaos Michailidis, A. Klink, E. Smyrnaios, M. Olivier, N. Baklatzoglou, L. Welschof, F. Stergioudi, Dimitris Lagoudas	Effect of wire-EDM and milling on aluminum foam on its surface structure, pore characteristics and mechanical response
MSEC2018-6793	Qing Sun, Baizhen Gao	Advanced Biomanufacturing for Bioenergy and In-Gut Medical Device Development
MSEC2018-6797	Brady Reed, Yan Zhou, Jeffrey Cirillo, Zhijian Pei, Hong Liang	Fabrication of Nanomaterials for Bacteria Treatment in Metalworking Fluids
MSEC2018-6804	Nancy Diaz-Elsayed, Qiong Zhang	Design Considerations Across Discrete and Continuous Processes for Sustainable Systems

MSEC2018-6807	Hoyeol Kim	Characterization of Dissimilar Joint between Inconel 718 and Alloy Steel by Laser Engineered Net Shaping
MSEC2018-6808	John Obielodan, Joshua Helman, Andrew Grumbles	Development of a PLA/Lignin Biocomposite for 3D Printing
MSEC2018-6657	MD Shah Jaman, Ala Qattawi	Knowledge-based Systems for Automatic Evaluation of Sheet Metal Design
MSEC2018-6776	Zhengyang Kang, Martin Byung-Guk Jun	Performance of Cutting Tools with Volcano-like Texture
MSEC2018-6775	Xingjian Wei, Zhijian Pei, Li Zeng	A Review in 3D Printing of Medical Models for Cyber-Manufacturing Systems

1550-1720 401

Session 1-2-7 - Advances in Additive Manufacturing Process Design & Part Performance - Part Performance I

Session Chair: Adrian Lutey | Session Co-Chair: Xin Zhao

MSEC2018-6406	Kailyn Cage, Briana Lucero, Dusan Spernjak, John Bernardin, Mark Fuge, Monifa Vaughn-Cooke	Thermal Design and Testing of a Passive Helmet Heat Exchanger with Additively Manufactured Components
MSEC2018-6496	Erica Liverani, Michele Conconi, Nicola Sancisi, Adrian Lutey, Alessandro Ascari, Alessandro Fortunato	Fabrication Of Knee Prostheses By Means Of SLM: Process And Functional Characterization
MSEC2018-6704	Xuan Song, Li He, Wenhua Yang, Zhuo Wang, Lei Chen	Co-continuous Piezocomposites With Triply Periodic Phase Interfaces For Enhanced Mechanical Flexibility and Piezoelectricity

1550-1720 403

Session 1-3-3 - Advances in Micro- and Nano-Additive Manufacturing - III

Session Chair: Yayue Pan | Session Co-Chair: Jing Shi

MSEC2018-6383	Obehi Dibua, Anil Yuksel, Nilabh Kumar Roy, Chee Seng Foong, Michael Cullinan	Nanoparticle Sintering Model, Simulation and Calibration Against Experimental Data
MSEC2018-6664	Bo Cheng, Brandon Lane, Justin Whiting, Kevin Chou	A Combined Experimental-Numerical Method to Evaluate Powder Thermal Properties in Laser Powder Bed Fusion
MSEC2018-6700	Zhihui Liu, Jing Shi, Yachao Wang	Evaluating Tensile properties of 3D Printed continuous Fiber Reinforces Nylon 6 Nanocomposites

1550-1720 407	**Session 2-8-2 - Advances in Data Management for the Digital Thread in Manufacturing - II** *Session Chair: Moneer Helu | Session Co-Chair: Binil Starly*	
MSEC2018-6501	Dazhong Wu, Yupeng Wei, Janis Terpenny	Surface Roughness Prediction in Additive Manufacturing Using Machine Learning
MSEC2018-6550	Thomas Hedberg, Moneer Helu, Timothy Sprock	A Standards and Technology Roadmap for Scalable Distributed Manufacturing Systems
MSEC2018-6660	Rafael Radkowski, Sravya Kanunganti	Augmented Reality System Calibration for Assembly Support with the Microsoft HoloLens
1550-1720 405	**Session 3-2-6 - Advances in Nontraditional Manufacturing Processes - VI** *Session Chair: Tsz Ho Kwok*	
MSEC2018-6515	William J. Emblom, Tyler Saltzman, Robin Babineaux, Katie Parr, Charles Nix, Ayotunde Olayinka, Scott Wagner, Muhammad Wahab	Friction Stir Back Extrusion: Tooling and Process Design for AL-1100-0
MSEC2018-6648	Scott Miller	Characterization of Material Transfer in Friction Stir Processing with a Consumable Tool
MSEC2018-6668	Christopher-Denny Matte, Michael Pearson, Felix Trottier-Cournoyer, Andrew Dafoe, Tsz Ho Kwok	Multi-Material Digital Light Processing Printer with Material Tower and Spray Cleaning
1550-1720 G102	**Session 4-1-5 - Advances in Processing and Design of Polymers and Polymer Composites - II** *Session Chair: Felicia Stan | Session Co-Chair: Nestor Vasquez*	
MSEC2018-6449	Loredana Santo, Leandro Iorio, Giovanni Matteo Tedde, Fabrizio Quadrini	Shape Memory Behavior of Carbon composites with functional Interlayer
MSEC2018-6628	Moataz Elsisy, Evan Poska, Mostafa Bedewy	Current-Dependent kinetics of Self-folding for Multi-Layer Polymers Using Local Resistive Heating
MSEC2018-6351	Muhammad Waliullah, Yong Gan, Ann Chen, Ryan Gan	Electrohrodynamically Processed Poly(vinylidene fluoride)/Polyaniline Composite Film on Soft Tissue Paper for Mechanoelectrical Energy Conversion and Vibration Sensing

1550-1720 G103	**Session 4-5-4 - Deformation Testing and Modeling** *Session Chair: Yang Guo | Session Co-Chair: Dinakar Sagapuram*	
MSEC2018-6341	Vandana A S, Narayan Sundaram	Interaction of a Sliding Wedge and a Metallic Specimen With a Near-Surface Inhomogeneity
MSEC2018-6629	Shwetabh Yadav, Tejas Murthy, Dinakar Sagapuram	An Experimental Study of Wedge Indentation of Porous Solids: Implications for Cutting and Drilling Processes
MSEC2018-6727	Rohit Voothaluru, Chunghorng Liu	Microstructure Sensitive Modeling for Fatigue Crack Initiation Life Prediction in 1053 Steel using a Crystal Plasticity Energy Criterion
1550-1720 G101	**Session 5-1-3 - Tissue Joining and Material Characterization** *Session Chair: Roland Chen | Session Co-Chair: Che-Hao Yang*	
MSEC2018-6637	Che-Hao Yang, Scott Phillips, Josh Ramsay, Wei Li, Roland Chen	Experimental Study On The Electrosurgical Tissue Joining Process With Process Parameters Monitoring For Quality Control
MSEC2018-6642	JuEun Lee, Seon Jeong Huh, Hee Joon Lee	Experimental Determination of Thermal Conductivity of Cortical Bone with Heat Loss Estimation
MSEC2018-6702	Xiaoran Li, Roland Chen, Wei Li	Effect of Compression Level and Heating Power on Bipolar Tissue Welding
1550-1720 G101	**Session 7-1-4 - Manufacturing USA 3** *Session Chair: Brad Kinsey | Session Co-Chair: Shreyes Melkote*	
MSEC2018-6548	Xilu Wang, Xiaoping Qian	Gaussian Process Model for Touch Probing
	Kirsten Kozlovsky, Jessica Schiltz, Tayler Kreider, Mukesh Kumar, Steven Schmid	Mechanical Properties of Reused Nylon Feedstock for Powder-bed Additive Manufacturing in Orthopedics
1550-1720 103	**Session 10-1-4 - RAMP Workshop Session 4** *Session Chair: Karl Haapala | Session Co-Chairs: KC Morris, Barbara Linke, Bill Bernstein*	
Workshop Activity	Karl Haapala, Barbara Linke, KC Morris, William Bernstein	Brainstorming Discussion: Revisiting the Research and Educational Challenges & Opportunities Relevant to NIST & NSF

1720-1800 Concourse **RAMP Poster Session & Awards**

Session Chair: Karl Haapala | Session Co-Chairs: Fu Zhao, Barbara Linke, KC Morris

RAMP Workshop organizers gratefully acknowledge the generous support of the National Science Foundation for its support of select students from U.S. institutions to attend the RAMP Workshop.
RAMP Workshop student travel awardees will present the following posters:

Amm Nazmul Ahsan, Bashir Khoda	Reusable Manufacturing Framework for Personalized Biomedical Devices
Waleed Khan, Nghi Hoang, Bruce Tai, Wayne Hung	Through-Tool Minimum Quantity Lubrication and Effect on Machinability
Prahar Bhatt, Max Peralta, Hugh Bruck, Satyandra Gupta	Realizing Next Generation Additive Manufacturing through Use of Advanced Robotics
Justin Canaperi, Yongxin (Jack) Guo, John Park, Jun (Albert) Yang, Yuki Yoshinaga	A Novel UMP Model of Grinding Processes
Wenchao Du, Xiaorui Ren, Yexiao Chen, Chao Ma, Miladin Radovic, Zhijian Pei	Model-Guided Particle Packing for Sustainable Material Design in Binder Jetting Additive Manufacturing
Zhe Gao, Weihong (Grace) Guo	Sensor Fusion and On-Line Monitoring of Friction Stir Blind Riveting: An Enabler for in-situ NDE
Destiny Garcia, Barbara Linke	Technical and Environmental Aspects of Quality Assurance
Hussain Alhader	UMP Model For Flexible Manufacturing System
Dustin Harper, Sriram Manoharan, Karl Haapala	Aggregating Unit Process Models to Enable Environmental Impact Characterization of Polymer-Based Hybrid Manufacturing
Hua-Wei Ko, Patrick Bazzoli, Adam Nisbett, Douglas Bristow, Yujie Chen, Shiv Kapoor, Placid Ferreira	Machine-Tool Error Observer Design With Application to Thermal Error Tracking
Timothy Simon, Yiran Yang, Wo Jae Lee, Jing Zhao, Lin Li, Fu Zhao	An Early Stage Process Selection Tool for Identifying Tradeoffs in Additive and Subtractive Manufacturing
Alejandro Najera-Acosta, Delia J. Valles-Rosales, Blanca R. Venegas-Mata	An Axiomatic Product Design in an Educational Manufacturing Cell: A Case Study
Timothy Simon, Yiran Yang, Wo Jae Lee, Jing Zhao, Lin Li, Fu Zhao	Sustainability Analysis of Stereolithography using UMP Models
Sai Desabathina, Andy Fan, Karl Haapala	Data Driven Unit Manufacturing Process (UMP) Model to Estimate Specific Energy of Surface Grinding Process

Muhammad Ali Ablat, Ala Qattawi	Unit Manufacturing Process of Origami-Based Sheet Metal Folding
Ian Garretson, Barbara Linke, Henning Voet, Björn Falk, Robert Schmitt	Peak Power and Energy Costs Example of Startup and Idling of a Grinder
Rishi Malhan, Ariyan Kabir, Brual Shah, Timotei Centea, Satyandra Gupta	Hybrid Cells for Multi-Layer Prepreg Composite Sheet Layup
Ramin Sabbagh, Farhad Ameri	Text Mining for Classification of Manufacturing Suppliers
Xinyan Ou, Qing (Cindy) Chang	Modeling, Analysis and Control of Manufacturing Work Cells with Gantries
Venkata Rajesh Saranam, Brian Paul	A Model Based Approach for Manufacturing Advanced Compact Heat Exchangers

NSF Travel Stipend Awardees (RAMP):

NSF-sponsored travel stipends were provided to the following students to attend the RAMP Workshop and the ASME-MSEC and SME-NAMRC conferences:

Muhammad Ali Ablat, *University of California - Merced*

AMM Nazmul Ahsan, *North Dakota State University*

Waleed Ashraf Khan, *Texas A&M University*

Prahar Bhatt, *University of Southern California*

Justin Canaperi, *Stony Book University*

Sai Desabathina, *Oregon State University*

Wenchao Du, *Texas A&M University*

Zhe Gao, *Rutgers University*

Destiny Garcia, *University of California - Davis*

Ian Garretson, *University of California - Davis*

Yongxin Guo, *Stony Book University*

Hussain Alhader, *Arizona State University*

Dustin Harper, *Oregon State University*

Rishi Kamal, *University of Southern California*

Hua-wei Ko, *University of Illinois - Urbana Champaign*

Wo Jae Lee, *Purdue University*

Sriram Manoharan, *Oregon State University*

Alejandro Najera Acosta, *New Mexico State University*

Xinyan Ou, *Stonybrook University*

Ramin Sabbagh, *University of Texas at Austin*

Venkata Rajesh Saranam, *Oregon State University*

Timothy Simon, *Purdue University*

Jun Yang, *Stony Book University*

Yuki Yoshinaga, *Stony Book University*

0910-1040 402	**NAMRC - TRACK 5 Manufacturing Education, Workforce Development and Outreach - Session 1** *Session Chair: Hitomi Yamaguchi*	
Paper 14	Weihang Zhu, Xuejun Fan, Nicholas Brake, Xinyu Liu, Xianchang Li, Jiang Zhou, Dorothy Sisk and Julia Yoo	Engineering Design and Manufacturing Education through Research Experience for High School Teachers
Paper 48	Joshua Grodotzki, Tobias R. Ortelt and A. Erman Tekkaya	Remote and Virtual Labs for Engineering Education 4.0 - Achievements of the ELLI project at the TU Dortmund University
Paper 53	Behzad Esmaeilian, Michael Rust, Praveen Kumare Gopalakrishnan, Sara Behdad	Use of Citizen Science to Improve Student Experience in Engineering Design, Manufacturing and Sustainability Education

0910-1040 404	**NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 3** *Session Chair: Dinakar Sagapuram*	
Paper 113	Yingmou Zhu, Ahmad Farhadi, Lin Gu, Xiaoming Kang and Wansheng Zhao	Observation analysis of arc plasma channel developing and expansion behavior in single arc discharging
Paper 151	Uma Shankar and Ramesh Babu N	A Model for Predicting the Geometry of Crater on Grinding Wheel Surface Ablated with a Single Pulsed Laser
Paper 235	Iskander El Amri, Ashif Sikandar Iquebal, Arun Srinivasa and Satish Bukkapatnam	Localized magnetic fluid finishing of freeform surfaces using electro-permanent magnets and magnetic concentration

0910-1040 405	**NAMRC - TRACK 3 Additive Manufacturing - Surface Finishing and Dimensional Accuracy** *Session Chair: Yayue Pan*	
Paper 32	Ali Khoshkhoo, Andres L. Carrano and David M. Blersch	Effect of surface slope and build orientation on surface finish and dimensional accuracy in material jetting processes
Paper 79	Sigmund A. Tronvoll, Christer W. Elverum and Torgeir Welo	Dimensional accuracy of threads manufactured by fused deposition modeling
Paper 117	Ilbey Karakurt, Kong Yin Ho, Christopher Ledford, Diana Gamzina, Timothy Horn, Neville C. Luhmann and Liwei Lin	Development of a magnetically driven abrasive polishing process for additively manufactured copper structures

0910-1040 406	**NAMRC - TRACK 1 Manufacturing Systems - Process analysis 5** *Session Chair: Dazhong Wu*	
Paper 197	Weihong Guo, Qi Tian, Zhengqian Jiang and Hui Wang	A Graph-Based Cost Model for Supply Chain Reconfiguration
Paper 124	Geir Ringen and Torgeir Welo	The product development learning process and it's relation to performance indicators

0910-1040 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 4** *Session Chair: Tony Schmitz*	
Paper 13	Andrew Honeycutt and Tony Schmitz	Receptance coupling model for variable dynamics in fixed-free thin rib machining
Paper 120	Shamsul Arefin, Senthil Kumar Anantharajan, Xinquan Zhang, Kui Liu and Mustafizur Rahman	An Experimental Investigation of Chip Deformation in Vibration-assisted Machining
Paper 157	Raja Kountanya and Changsheng Guo	Force and Temperature Modeling in 5 - axis Grinding

1100-1230 402	**NAMRC - TRACK 5 Manufacturing Education, Workforce Development and Outreach - Session 2** *Session Chair: Hitomi Yamaguchi*	
Paper 115	Kamyar Raoufi, Arvind Shankar Raman, Karl Haapala, Brian Paul	Benchmarking Undergraduate Manufacturing Engineering Curricula in the United States
Paper 102	David Cochran and Joseph Smith	A Systematic Design Approach to Manufacturing Education
Paper 145	Brian Paul and Patrick McNeff	A Pedagogical Framework for Manufacturing Process Design

1100-1230 404	**NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 4** *Session Chair: Dinakar Sagapuram*	
Paper 12	Leeladhar Nagdeve, V K Jain and Ramkumar J	Development of inverse replica fixture for Nano-finishing of Knee Joint using R-MRAFF process
Paper 25	Anil Srivastava, Harish Kumar and Sehijpal Singh	Investigations into Internal Surface Finishing of Titanium (Grade 2) Pipe with Extended Magnetic Tool
Paper 26	Aneesh Joshi and Sagil James	Molecular Dynamics Simulation Study on Effect of Process Parameters on Coatings during Cold Spray Process

1100-1230 406	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Monitoring 1** *Session Chair: Z.J. Pei*	
Paper 22	Richard Meyes, Hasan Tercan, Thomas Thiele, Alexander Krämer, Julian Heinisch, Martin Liebenberg, Gerhard Hirt, Christian Hopmann, Gerhard Lakemeyer, Tobias Meisen, Sabina Jeschke	Interdisciplinary Data Driven Production Process Analysis for the Internet of Production
Paper 52	Ardeshir Raihanian Mashhadi, Willie Cade and Sara Behdad	Moving towards Real-time Data-driven Quality Monitoring: A Case Study of Hard Disk Drives
Paper 62	Huicheng Zhou, Pengcheng Hu, Huiling Tan, Jihong Chen and Guoan Liu	Modelling and compensation of thermal deformation for machine tool based on the real-time data of the CNC system

1100-1230 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 5** *Session Chair: Tony Schmitz*	
Paper 132	Leonardo Rosa Ribeiro Da Silva, Antonio Favero Filho, Eder Silva Costa, David Fernando Marcucci Pico, Wisley Falco Sales, Wilson Luiz Guesser, Alisson Rocha Machado	Cutting Temperatures in End Milling of Compacted Graphite Irons
Paper 216	Rishi Pahuja and Ramulu Mamidala	Process monitoring in milling unidirectional composite laminates through wavelet analysis of force signals
Paper 218	Arvind Natarajan, Viswanathan Madhavan and Wilfredo Moscoso-Kingsley	Tool temperature distribution in modulation-assisted machining

1400-1530 402	**NAMRC - TRACK 1 Manufacturing Systems - Process Design** *Session Chair: Grace Guo*	
Paper 162	Ibraheem Redhwi, Tian Lan, Sonal Padalkar, Pranav Shrotriy	Picosecond Laser based Additive Manufacturing of Hydroxyapatite Coatings on Cobalt Chromium Surfaces
Paper 164	Ruinan Xie, Chad Ulven and Bashir Khoda	Design and Manufacturing of Variable Stiffness Mattress
Paper 217	Zeyi Guan, Xiaochun Li and Injoo Hwang	Highly Concentrated WC Reinforced Ag Matrix Nanocomposite Manufactured by Molten Salt Assisted Stir Casting

1400-1530 404	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Planning 1** *Session Chair: Binil Starly*	
Paper 140	Hasan Sinan Bank, Sandeep D'Souza and Aditya Rasam	Temporal Logic (TL)-Based Autonomy for Smart Manufacturing Systems
Paper 154	Dusan Sormaz, Arkopaul Sarkar and Subhabrata Ghosal	IMPlanner-MAS: A Multiagent System for Distributed Manufacturing Process Planning
Paper 2	Kristen Hughes, Frank Cea and Duncan Beaumont	Automating the Factory Environment

1400-1530 405	**NAMRC - TRACK 2 Manufacturing Processes - Composite Machining** *Session Chair: Loredana Santo*	
Paper 56	Zahra Fattahi Massoom, Hussien Hegab and Hossam Kishawy	Analytical Prediction of Delamination during Drilling Composite Laminates
Paper 95	Jinyang Xu, Chao Li, Mohamed El Mansori, Gongyu Liu and Ming Chen	Study on the Frictional Heat at Tool-work Interface when Drilling CFRP Composites
Paper 125	Parvesh Antil, Sarbjit Singh and Perminder Jit Singh	Taguchi's Methodology Based Electrochemical Discharge Machining of Polymer Matrix Composites

1400-1530 406	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Monitoring 2** *Session Chair: Ihab Ragai*	
Paper 89	Carlos Escobar, Jeffrey Abell, Marcela Hernandez-De-Menendez and Ruben Morales-Menendez	Process-Monitoring-For-Quality — Big Models
Paper 119	Guicai Zhang, Changle Li, Haitao Zhou and Timothy Wagner	Punching process monitoring using wavelet transform based feature extraction and semi-supervised clustering
Paper 139	Dezun Zhao, Jianyong Li, Weidong Cheng, Peng Wang, Robert X Gao and Ruqiang Yan	Vold-Kalman generalized demodulation for multi-fault detection of gear and bearing under variable speed

1400-1530 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 6** *Session Chair: Benxin Wu*	
Paper 96	Ramasubramanian K, Arunachalam N and Ramachandra Rao M.S	Performance analysis of Nano Engineered Diamond coated tools for machining of AA2124/ SiCp composite material
Paper 199	Rajesh Kumar Ananda-Kumar, Wilfredo Moscoso-Kingsley, Gregor Jacob, Alkan Donmez and Viswanathan Madhavan	Machining behavior of additively manufactured and cast-wrought nickel-based super alloy (IN 625)
Paper 181	Sagil James and Murali Sundaram	Effects of water molecules on material removal behavior in Vibration Assisted Nano Impact-machining by Loose Abrasives - A molecular dynamics simulation study
1550-1720 402	**NAMRC - TRACK 1 Manufacturing Systems - Risk analysis** *Session Chair: Grace Guo*	
Paper 63	Keshav Nandurkar, Anand Relkar and Padmakar Pawar	Minimizing machine failure through Risk analysis
Paper 77	Sudhir Punyamurthula and Fazleena Badurdeen	Assessing Production Line Risk using Bayesian Belief Networks and System Dynamics
1550-1720 404	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Planning 2** *Session Chair: Binil Starly*	
Paper 28	Jasprabhjit Mehami, Mauludin Nawi and Ray Y. Zhong	Smart AGV for Manufacturing in the context of Industry 4.0
Paper 166	J. Cecil	An IoT Based Cyber-Physical Framework for Micro Devices Assembly
Paper 183	Yunbo Zhang and Tsz Ho Kwok	Design and Interaction Interface using Augmented Reality for Smart Manufacturing

1550-1720 406	**NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Monitoring 3** *Session Chair: Ihab Ragai*	
Paper 153	Kalpana Kannan, N. Arunachalam, Aakash Chawla and Sundararajan Natarajan	Multi-Sensor data analytics for Grinding Wheel Redress life estimation- an Approach towards Industry 4.0
Paper 208	Zimo Wang, Ashif Iquebal and Satish Bukkapatnam	A vision-based monitoring approach for real-time control of laser origami cyber-manufacturing processes
Paper 223	Ricardo Toro, Jorge E. Correa and Placid M. Ferreira	A Cloud-Monitoring Service for Manufacturing Environments

1550-1720 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 7** *Session Chairs: Benxin Wu and Zheng Kang*	
Paper 24	Burak Sencer and Mukhtar Maulimov	A New Turning System Assisted By Chip-Pulling
Paper 198	Rapeepan Promyoo, Hazim El-Mounayri and Mangilal Agarwal	Experimental Study of Material Removal at Nanoscale
Paper 215	Dipesh B. Trivedi, Ankit Kumar and Suhas S. Joshi	Drilling of Titanium Alloy using Heat Sink-based Ice Water Cooling

FRIDAY, JUNE 22, 2018

TIME	LOCATION	EVENT
07:30 - 13:00	Lobby	Registration/Information
07:30 - 08:30	Legacy Club-4th Fl.	Continental Breakfast
08:40 - 10:10		Technical Session 13
10:10 - 10:30	Field Box Concourse	Break
10:30 - 12:00		Technical Session 14
12:00 - 13:00	Main Hall	Boxed Lunch Pick-up

0840-1010 401	**Session 4-5-5 - Material Properties and Testing** *Session Chair: Rohit Voothaluru | Session Co-Chair: Dinakar Sagapuram*	
MSEC2018-6471	Xiaoman Zhang, Yang Mu, Shuai Shao, Collin Wick, Ramu Ramachandran, Wen Meng	Assessing mechanical integrity of metal/ceramic interfaces through in-situ micro mechanical testing
MSEC2018-6472	Bin Zhang, Yooseob Song, George Voyiadjis, Kristian Juul, Shuai Shao, Wen Meng	Measuring mechanical response of metals in small scale uniaxial testing and metal forming operations
MSEC2018-6509	Feng Zhang, Arif Malik, Haoliang Yu	High-Fidelity Roll Profile Contact Modeling by Simplified Mixed Finite element Method
1030-1200 405	**Session 3-5-10 - Manufacturing Process - V** *Session Chair: Ihab Ragai | Session Co-Chair: Chetan Nikhare*	
MSEC2018-6486	Bradley Pier, Chetan Nikhare	Outer Diameter to Thickness Ratio Effect on tube Flaring Behavior
MSEC2018-6706	Mohammad Hatamleh, Sepehr Sadeh, Tayyub Farooq, Arif Malik, Dong Qian	Finite Element Study of Laser Peening on Selective Laser Melted A357 Aluminum Alloy During Tension Test
MSEC2018-6581	Biao Zhang, Quan-ke Pan, Liang Gao, Yaobang Zhao	MOEA/D for Multi-objective Hybrid Flowshop Rescheduling Problem

0840-1010 103	NAMRC - TRACK 2 Manufacturing Processes - Numerical Simulation *Session Chair: Bryan Dods*	
Paper 207	Jithin S, Ajinkya Raut, Upendra V Bhandarkar and Suhas S Joshi	FE Modeling for Single Spark in EDM Considering Plasma Flushing Efficiency
Paper 229	Stéphane Bessonnet, Mohamed El Mansori, Sabeur Mezghani and Sébastien Pinault	Multi-scale computation of multistage manufacturing process signatures of glassy polymers multi-functionalisation

0840-1010 402	NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 5 *Session Chair: Yihao Zheng*	
Paper 68	Faissal Chegdani, Satish T.S. Bukkapatnam and Mohamed El Mansori	Thermo-mechanical Effects in Mechanical Polishing of Natural Fiber Composites
Paper 69	Faissal Chegdani, Behrouz Takabi, Bruce L. Tai, Mohamed El Mansori and Satish T.S. Bukkapatnam	Thermal Effects on Tribological Behavior in Machining Natural Fiber Composites
Paper 88	Pei-Ying Wu and Hitomi Yamaguchi	Material Removal Mechanism of Additively Manufactured Components Finished using Magnetic Abrasive Finishing

0840-1010 404	NAMRC - TRACK 3 Additive Manufacturing - Hybrid Processes 1 *Session Chair: Alaa Alwany*	
Paper 107	Jørgen Blindheim, Øystein Grong, Ulf Roar Aakenes, Torgeir Welo and Martin Steinert	Hybrid metal extrusion & bonding (HYB) - a new technology for solid-state additive manufacturing of aluminium components
Paper 111	Michael Gomez, Jarred Heigel and Tony Schmitz	Force modeling for hybrid manufacturing
Paper 149	Ahasan Habib and Bashir Khoda	Development of clay based novel bio-ink for 3D bio-printing process

0840-1010 Burkhardt	**NAMRC - TRACK 2 Manufacturing Processes - Machining 8** *Session Chair: Jyhwen Wang*	
Paper 70	Edward De Meter, Varad Tripathi, Andrew Armstrong, Xi Gong, Guha Manogharan and Timothy Simpson	Milling of Inconel 718 Block Supports Fabricated using Laser Powder Bed Fusion
Paper 83	Han Wu, Jianfeng Ma, Qingling Meng, Muhammad Jahan and Farshid Alavi	Numerical modeling of electrical discharge machining of Ti-6Al-4V
Paper 91	Waleed Ashraf Khan, Nghi Hoang, Bruce Tai and Wayne N.P. Hung	Through-Tool Minimum Quantity Lubrication and Effect on Machinability

1030-1200 103	**NAMRC - TRACK 3 Additive Manufacturing - Numerical Simulation** *Session Chair: Edward De Meter*	
Paper 189	Leila Ladani and Jafar Razmi	Simulation of Bead Formation using Multi-physics Modeling of Powder Bed Laser Melting of Inconel 718
Paper 205	Yachao Wang and Jing Shi	Influence of laser scan speed on micro-segregation in selective laser melting of an iron-carbon alloy: A multi-scale simulation study
Paper 209	Chaitanya Vundru, Santanu Paul, Ramesh Singh, Wenyi Yan	Numerical analysis of multi layered laser cladding for die repair applications to determine residual stresses and hardness

1030-1200 402	**NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 6** *Session Chair: Guoying Dong*	
Paper 17	John Gagliardi, Vince Romero, Ryan Dion	The Dynamics of Grinding Glass with Trizact™ Diamond Tile
Paper 127	S Niketh and G.L Samuel	Numerical modeling of micro textured surfaces and experimental investigation on drilling performance of coated micro textured tools
Paper 180	Yang Yang and Ping Guo	Effect of elliptical vibration trajectories on grating structure formation and its application in structural coloration

1030-1200 404	NAMRC - TRACK 3 Additive Manufacturing - Hybrid Processes 2 *Session Chair: Alaa Alwany*	
Paper 202	Jarred Heigel, Thien Phan, Jason Fox and Thomas Gnaupel-Herold	Experimental Investigation of Residual Stress and its Impact on Machining in Hybrid Additive/ Subtractive Manufacturing
Paper 213	Muhammed Sadiq, Nghi Hoang, Nicholas Valencia and Suleiman Obeidat, Wayne Hung	Experimental study of micromilling selective laser melted Inconel 718 superalloy
Paper 221	Alyssa Brandley, Robyn Hollfelder, Sepehr Nesaei, Bernard Vanwie, Nehal Abu-Lail and Arda Gozen	Direct-Ink-Writing of Degradable Carboxymethylcellulose

1030-1200 Burkhardt	NAMRC - TRACK 2 Manufacturing Processes - Machining 9 *Session Chair: Jyhwen Wang*	
Paper 9	Milton Vieira Junior, Elesandro Antonio Baptista, Luciana Araki, Scott Smith and Tony Schmitz	The role of tool presetting in milling stability uncertainty
Paper 84	Mukhtar Maulimov and Burak Sencer	Effect of Directional Relations on Milling Chatter Stability and Development of a Stability Index
Paper 228	Namrata Karmakar and Sathyan Subbiah	Investigating Bowing of Hot Wire during cutting of EPS

FRIDAY, JUNE 22, 2018

RESOURCES

Network: **athletics-guest**
Password: **Blarson#14**

NAMRC 46 final papers:

kth.box.com/s/8tqaq7kj0tcal1xehhykfp322ji5qq8b

Complimentary shuttle service will be provided to participants who made a reservation at one of the partnering hotels listed below. Shuttle stops will be visible at each hotel property.

- Aloft
- Calvary Court
- Embassy Suites by Hilton College Station
- Hawthorn Suites
- Hilton College Station
- The George
- TownePlace Suites

If you choose to drive your own vehicle, you can purchase a parking permit to be used in Lot 100 located near Reed Arena. Please click on the link below to purchase a permit. Free shuttle service will be provided from the Reed Arena parking lot to the conference venue.

transport2.tamu.edu/account/conference/parkingpermits.aspx

The shuttle service schedule is listed below. Buses will run continuously during the times mentioned. If you require transportation outside the listed timeframes, you will need to make your own arrangements:

Monday - 6/18/2018
8:30 AM – 10:30 AM
11:00 AM – 1:00 PM
6:00 PM – 8:00 PM

Tuesday - 6/19/2018
6:45 AM – 8:45 AM
12:00 PM – 2:00 PM
5:00 PM – 7:00 PM

Wednesday - 6/20/2018
6:45 AM – 8:45 AM
12:00 PM – 2:00 PM
5:00 PM – 7:00 PM

Thursday - 6/21/2018
6:45 AM – 8:45 AM
12:00 PM – 2:00 PM
6:00 PM – 8:00 PM

Friday - 6/22/2018
7:15 AM – 9:15 AM
11:00 AM – 1:00 PM

SESSION SUMMARY

	Session 1 G101	Session 2 G102	Session 3 G103	Session 4 101	Session 5 103	Session 6 401
Tues., June 19						
0910-1040	MSEC Symp 3-5-1	NAMRC - TRACK 2 Manufacturing Processes - Material fabrication 1 (71, 82, 103)	MSEC Symp 4-2-1	NAMRC - TRACK 2 Manufacturing Processes - Forming (6, 64, 177)	Student Mfg Design Competition Session 1	MSEC Symp 1-1-1
1100-1230	NAMRC - TRACK 1 Manufacturing Systems - Optimization (18, 50, 73)	NAMRC - TRACK 2 Manufacturing Processes - Material fabrication 2 (196, 206, 214)	MSEC Symp 4-5-1	NAMRC - TRACK 2 Manufacturing Processes - Design (51, 169, 170)	Symposium Invited Speaker 1: Xinhua Wu	NAMRC - TRACK 3 Additive Manufacturing - Process Design (175, 184, 211)
1400-1530	NAMRC - TRACK 2 Manufacturing Processes - Micro-machining (43, 92, 203)	MSEC Symp 5-7-1	ASME MED 100 Years Meeting	MSEC Symp 1-2-1	Symposium Invited Speaker 2: Glenn Daehn	MSEC Symp 4-1-1
1550-1720	MSEC Symp 3-5-2	MSEC Symp 4-7-1	MSEC Symp 3-3-1	MSEC Symp 1-2-2	Student Mfg Design Competition Session 2	MSEC Symp 4-1-2
Wed., June 20						
0910-1040	MSEC Symp 5-1-4	MSEC Symp 2-3-3	MSEC Symp 3-6-1	MSEC Symp 3-7-1	Federal Agencies' Perspectives on Advanced Manufacturing	MSEC Symp 1-1-2
1100-1230	MSEC Symp 5-1-2	MSEC Symp 5-7-2	MSEC Symp 4-2-3	MSEC Symp 4-6-1	Symposium Invited Speaker 3: Dong-Woo Cho	NAMRC - TRACK 2 Manufacturing Processes - Tool Wear (74, 86, 98)
1400-1530	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Case studies 1 (8, 46, 97)	MSEC Symp 4-1-3	MSEC Symp 4-5-2	MSEC Symp 1-2-3	Blue Sky Competition Session 1	MSEC Symp 3-5-5
1550-1720	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Case studies 2 (188, 200, 10)	MSEC Symp 5-5-1	MSEC Symp 4-2-4	MSEC Symp 1-2-4	Blue Sky Competition Session 2	MSEC Symp 3-5-6

Session 7 402	Session 8 403	Session 9 404	Session 10 405	Session 11 406	Session 12 407	Session 13 Burkhardt
NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 1 (21, 42, 241)	MSEC Symp 2-1-1	NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 1 (58, 150, 185)	MSEC Symp 2-2-1	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Simulation 1 (80, 163, 101)	MSEC Symp 2-5-1	NAMRC - TRACK 2 Manufacturing Processes - Machining (57, 131, 122)
NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 2 (109, 114, 123)	MSEC Symp 2-1-2	NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 2 (142, 227, 230)	MSEC Symp 2-3-1	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Simulation 2 (60, 30, 87)	MSEC Symp 2-8-1	NAMRC - TRACK 2 Manufacturing Processes - Machining 2 (4, 66, 191)
NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 3 (135, 146, 148)	MSEC Symp 2-2-2	NAMRC - TRACK 3 Additive Manufacturing - Post-processing (232, 233)	MSEC Symp 5-1-1	NAMRC - TRACK 2 Manufacturing Processes - Welding and Joining 3 (65, 138, 172)	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Cloud Manufacturing (61, 219)	NAMRC - TRACK 2 Manufacturing Processes - Machining 3 (100, 104, 143)
NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 4 (155, 174, 225)	MSEC Symp 1-3-1	NAMRC - TRACK 3 Additive Manufacturing - Case studies (130, 224, 231)	MSEC Symp 2-3-2	NAMRC - TRACK 2 Manufacturing Processes - Composite Forming (40, 81, 187)	MSEC Symp 3-4-1	MSEC Symp 3-2-1
NAMRC - TRACK 6 Industrial Applications and Manufacturing Implementation - Session 5 (11, 239)	MSEC Symp 1-3-2	NAMRC - TRACK 3 Additive Manufacturing - Process monitoring 1 (159, 168, 194)	MSEC Symp 2-2-3	NAMRC - TRACK 1 Manufacturing Systems - Process analysis 1 (116, 156, 193)	MSEC Symp 3-5-3	MSEC Symp 3-2-2
NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 1 (33, 39, 190)	MSEC Symp 1-5-1	NAMRC - TRACK 3 Additive Manufacturing - Process monitoring 2 (160, 144, 226)	MSEC Symp 7-3-1	NAMRC - TRACK 1 Manufacturing Systems - Process analysis 2 (20, 23, 35)	MSEC Symp 3-5-4	What's New at NSF – Update from NSF Program Directors
NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 2 (105, 128, 27)	MSEC Symp 1-4-1	NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 1 (47, 36, 237)	MSEC Symp 3-1-1	NAMRC - TRACK 1 Manufacturing Systems - Process analysis 3 (41, 90, 94)	MSEC Symp 2-5-2	MSEC Symp 3-2-3
NAMRC - TRACK 3 Additive Manufacturing - Mechanical Resistance 3 (49, 178, 210)	MSEC Symp 2-1-3	NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 2 (37, 54, 238)	MSEC Symp 2-4-1	NAMRC - TRACK 1 Manufacturing Systems - Process analysis 4 (15, 93, 133)	MSEC Symp 2-6-1	MSEC Symp 3-2-4

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NAMRC - TRACK 5 Manufacturing Education, Workforce Development and Outreach - Session 2 (115, 102, 145)	MSEC Symp 4-2-2	NAMRC - TRACK 2 Manufacturing Processes - Surface Finishing and Coating 4 (12, 25, 26)	MSEC Symp 3-2-5 (and MForesight)	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Monitoring 1 (22, 52, 62)	MSEC Symp 3-7-3	NAMRC - TRACK 2 Manufacturing Processes - Machining 5 (132, 216, 218)
NAMRC - TRACK 1 Manufacturing Systems - Process Design (162, 164, 217)	MSEC Symp 2-3-4	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Planning 1 (140, 154, 2)	NAMRC - TRACK 2 Manufacturing Processes - Composite Machining (56, 95, 125)	NAMRC - TRACK 4 Smart Manufacturing and Cyber-Physical Systems - Process Monitoring 2 (89, 119, 139)	MSEC Symp 2-10-2	NAMRC - TRACK 2 Manufacturing Processes - Machining 6 (96, 199, 181)
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