

**BOARD OF TRUSTEES
UNIVERSITY OF THE DISTRICT OF COLUMBIA
UDC RESOLUTION NO. 2018 – 13**

SUBJECT: Tenure Approval for Dr. Jiajun Xu, School of Engineering and Applied Sciences

WHEREAS, Dr. Jiajun Xu is a recently promoted Associate Professor of Mechanical Engineering who has petitioned the University of the District of Columbia (“University”) to be granted tenure in the department in which he is qualified; and

WHEREAS, pursuant to 8B DCMR §1462, Dr. Devas Shetty, Dean of the School of Engineering and Applied Sciences, in conjunction with the Engineering Faculty, has conducted a thorough review of Dr. Xu’s background and record of achievements in teaching, scholarship and university and community service, highlights of which are set forth on Appendix A attached hereto, and on that basis the Dean recommends that Dr. Xu be awarded tenure; and

WHEREAS, the President has affirmed the recent promotion from Assistant to Associate Professor for Dr. Xu, and has further affirmed the recommendation of tenure for Dr. Xu from the Dean and the Engineering Faculty of the School of Engineering and Applied Sciences, and the President has forwarded their recommendation for award of tenure to the Board of Trustees;

NOW THEREFORE BE IT RESOLVED, that the Board of Trustees of the University approves the award of tenure to Dr. Jiajun Xu, School of Engineering and Applied Sciences, at the rank of Associate Professor.

Submitted by the Academic &
Student Affairs Committee:

May 31, 2018

Approved by the Board of Trustees:

June 28, 2018



Christopher Bell
Chairperson of the Board

FISCAL IMPACT STATEMENT

TO: The Board of Trustees
FROM: Managing Director of Finance *David L. Franklin*
DATE: May 25, 2018
SUBJECT: Tenure Approval for Dr. Jiajun Xu

Conclusion

There is no fiscal impact associated with the granting of tenure to Dr. Jiajun Xu at the academic rank of Associate Professor in the School of Engineering & Applied Sciences (SEAS) of the University of the District of Columbia (UDC). The Department Evaluation and Promotion Committee (DEPC) committee conducted a review and prepared a report in order to make a recommendation to the dean regarding tenure for this professor, who joined the UDC faculty in August 2013.

Background

The DEPC committee reviewed Dr. Xu's teaching, scholarship, and service to UDC and concluded that he is an excellent teacher, who has served as Assistant Professor at UDC since 2013, and is recognized by his students, faculty members, administrators, and other experts in his field for his strong contributions to undergraduate research involving students. Dr. Xu has provided significant leadership in areas of nanotechnology-enabled energy management research, and has collaborated with technical experts at the Department of Defense, the Department of Energy, and the National Science Foundation that has resulted in over \$1.1 million in funding. Dr. Xu is also recognized for his contributions to the UDC community, including successfully supervising multidisciplinary student teams in national competitions such as the AMIE Design challenge competition and a NASA-sponsored human-powered Mars Rover competition.

A recommendation of tenure for Dr. Jiajun Xu at the academic rank of Associate Professor has been affirmed by the Dean, the Chief Academic Office, and the President. The President has forwarded the recommendation to the Board of Trustees.

Financial Impact

This request has been approved based upon the information provided. There are no anticipated risks at this time.

Appendix A

REPRESENTATIVE ACHIEVEMENTS – TENURE APPOINTMENT

JIAJUN XU, Ph.D., P.E.

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Content:

1. *Professional Preparation*
2. *Research: Impact and publications*
3. *Funding: > \$0.9 million awarded and > \$9 million submitted*
4. *Research and teaching capacity development at UDC*
5. *Major research achievement from UDC and prior institutions*
6. *Awards and distinctions*
7. *Teaching*
8. *Service*

Professional Preparation:

Academic Degrees:

University of Maryland, College Park, USA	Mechanical Engineering	Ph.D., 2013
University of Maryland, College Park, USA	Mechanical Engineering	M.S., 2010
Southeast University, China	Power Engineering	B.S., 2007

Professional Qualifications:

Licensed Professional Engineer	State of Maryland	2016-present
Certified LabVIEW developer	National Instrument	2013-present

Appointment History:

Office of Naval Research, Summer Faculty Research Program Fellow, (June.2017-August.2017)

Office of Naval Research, Summer Faculty Research Program Fellow, (May.2016-August.2016)

Office of Naval Research, Summer Faculty Research Program Fellow, (May.2015-August.2015)

University of the District of Columbia, Department of Mechanical Engineering, Assistant Professor (2013 – Present)

University of Maryland-College Park, A. James Clark School of Engineering, Future Faculty Fellow (2010 – 2013)

University of Maryland-College Park, Department of Mechanical Engineering, Graduate Research Fellow in Micro/nanoscale thermal transport and energy conversion Laboratory (2008 – 2013)

Research:

Citations, quality and impact:

- 253 citations since 2010 in the Google Scholar and h-impact index of 7
 - Research results published in top-cited journals in the fields from Prestigious publishers (i.e., Elsevier, Springer and Nature):
 - International Journal of Heat and Mass Transfer, 2016 Citation Index: 3.75. No.2 in Heat Transfer area and No.4 among all journals published by Elsevier. Source: <http://about.elsevier.com/metrics/2017/50.htm>.
 - Nanoscale Research Letters, 2016 Citation Index: 2.833 highest among all Springer published journals in Materials discipline. Source: <http://www.springer.com/gp/authors-editors/journal-author/impact-factors/materials-if-journals>.
 - Scientific Report from NATURE research journal, 2016 Citation Index: 4.847. Source: http://www.nature.com/npg_/company_info/journal_metrics.html?foxtrotcallback=true.
 - 16.3 RG Score: impact score for the published research. This score is higher than 63% of worldwide membership (Source www.researchgate.net)
 - 1074 viewing of my research papers in the last 20 weeks (Source www.researchgate.net)
 - \$ 902,000 research funding by National Science Foundation, Department of Defense, and United States Department of Agriculture
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Journal Publications:

1. Jiajun Xu, Trinh Vu, Thanh N. Tran, "Single-phase flow and heat transfer characteristics of ethanol/polyalphaolefin nanoemulsion fluids in circular minichannels", *International Journal of Heat and Mass Transfer*, Volume 113, 2017, Pages 324-331
2. Jiajun Xu, Trinh Vu, "An Experimental Study on Flow and Heat Transfer Characteristics of Ethanol/Polyalphaolefin Nanoemulsion Flowing Through Circular Minichannels", *Nanoscale Research Letters* (2017) 12: 216.
3. Jiajun Xu, Trinh Vu, Tolessa Deksissa, "Development and characterization of a hybrid mesoporous material infused with metallic oxide nanoparticles for water treatment", *Nanomaterials and Nanotechnology*, Volume 7: 1–8, 2017
4. Collin Baker, Denikka Brent, Charles Wilson, Jiajun Xu and Lara A Thompson, "Additive Manufacturing for Economical, User-Accessible Upper-limb Prosthetics", *Prosthetics and Orthotics Open Journal* Vol.1 No.1:8 2017
5. Fangyu Cao, Ying Liu, Jiajun Xu, Yadong He, B. Hammouda, Rui Qiao, Bao Yang, "Probing Nanoscale Thermal Transport in Surfactant Solutions", *Scientific Reports* 5, Article number: 16040 (2016)

6. Jiajun Xu, Boualem Hammouda, Fangyu Cao, Bao Yang, "Experimental study of thermophysical properties and nanostructure of self-assembled water/polyalphaolefin nanoemulsion fluids," vol. 7 no. 4, *Advances in Mechanical Engineering*, April 2015
7. Liangbin Hu, Hongli Xu, Jiajun Xu, Bao Yang, "Highly Thermally Conductive Papers with Percolative Layered Boron Nitride Nanosheets" *ACS Nano*, March 2014
8. Jiajun Xu, Bao Yang, "Nanostructured Phase Changeable Heat Transfer Fluids", *Nanotechnology Reviews*. De Gruyter, Volume 2, Issue 3, Pages 289–306. 2013
9. Jiajun Xu, Bao Yang, Boualem Hammouda, "Thermophysical Properties and Pool Boiling Characteristics of Water in Polyalphaolefin Nanoemulsion Fluids", *ASME Journal of Heat Transfer*, 135(9), 091303, 2013
10. Jiajun Xu, Bao Yang, Boualem Hammouda, "Thermal conductivity and Viscosity of Self-assembly Alcohol/Polyalphaolefin Nanoemulsions" *Nanoscale Research Letters*, 2011, 6:274
11. Chunwei Wu, Tae Joon Cho, Jiajun Xu, Donggeun Lee, Bao Yang, and Michael R. Zachariah, "Effect of nanoparticle clustering on the effective thermal conductivity of concentrated silica colloids" *Physical Review E* 81, 011406, 2010
12. Jiajun Xu, Bao Yang, "Thermal and Phase Change Characteristics of Self-Assembled Ethanol/Polyalphaolefin Nanoemulsion Fluids", *Journal of Thermophysics and heat transfer AIAA* ,Vol.24, No.1, January–March 2010
13. Jiajun Xu, Yuwen Zhang, and Hongbin Ma., "Effect of Internal Wick Structure on Liquid-Vapor Oscillatory Flow and Heat Transfer in an Oscillating Heat Pipe," *ASME Journal of Heat Transfer*, Volume 131, Issue 12, 121012, 2009
14. Jiajun Xu, Yuwen Zhang, "Analysis of Heat Transfer during Liquid-Vapor Pulsating Flow in a U-Shaped Miniature Channel" *Journal of Enhanced Heat Transfer*, 16(4), 2009

Book Chapters:

Phase Change Material Particles and Their Application in Heat Transfer Fluids

Author: Jiajun Xu, Fangyu Cao, Bao Yang
Series Title: Springer's Green Energy and Technology Series
Volume: Low Cost Nanomaterials: Toward Greener and More Efficient Energy Application
Editors: Zhiqun Lin and Jun Wang
ISBN: 978-1-4471-6472-2
Publisher: Springer-Verlag London

Thermophysical Properties and SANS studies of Nanoemulsion Heat Transfer Fluids

Author: Jiajun Xu, Bao Yang
Series Title: Neutron Scattering

Chapter: No. 4
Editors: Waldemar Alfredo Monteiro
ISBN: 978-953-51-4618-6
Publisher: InTech

Peer-Reviewed Conference Publications:

1. Robert Stephenson, Cyree Beckett, Jiajun Xu, " Nucleate Boiling Bubble Dynamics Study of Ethanol/PAO Nanoemulsion using Synchronized High-Speed Video and Infrared Thermometry", *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2017, Tampa, FL, USA
2. Trinh Vu, Highqueen Sarpomah, Michael Kamen, Tolessa Deksissa, Jiajun Xu, "Nanoparticles Infused Mesoporous Material for Water Treatment Processes", *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2017, Tampa, FL, USA
3. Jiajun Xu, "Implementation of Student Presentation-based Active Learning (SPAL) Approach in Undergraduate Engineering Curriculum", *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2017, Tampa, FL, USA
4. Devdas Shetty, Jiajun Xu, "Design For Disassembly As Sustainable Product Evaluation Method – Example Of Underground Escalator", *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2017, Tampa, FL, USA
5. Robert Stephenson, Jiajun Xu, "Synchronized High-Speed Video and Infrared Thermometry Study of Bubble Dynamics during Nucleate Boiling of Nanoemulsion", *ASME 2017 Summer Heat Transfer Conference*, July 9-14, 2017, Bellevue, Washington, USA
6. Fana Zewede, Henok Argaw, Thanh Tran, Jiajun Xu, "Convective Heat Transfer of Ethanol/Polyalphaolefin Nanoemulsion inside Circular Minichannel Heat Exchanger", *ASME 2017 Summer Heat Transfer Conference*, July 9-14, 2017, Bellevue, Washington, USA
7. Morris Thomas, Pawan Tyagi, Hampton-Garland, Carl Moore, Sasan Haghani, Jiajun Xu, and Lara Thompson, "Student Presentation-based Effective Teaching (SPET) Strategy: A New & Innovative Approach to Student Engagement" National Association of Student Affairs Professionals 63rd National Conference, February 16-18, 2017 Durham, North Carolina.
8. Naresh Poudel, Musa Acar, Thanh Tran, Jiajun Xu, "An Experimental and Numerical Study of Convective Boiling of Nanoemulsion inside Mini-channels Heat Exchanger" *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2016, Phoenix, AZ
9. Devdas Shetty, Naresh Poudel, Jiajun Xu, "A New Technique For Evaluating Disassembly And Maintenance Using An Example Of Underground Escalator", *ASME 2015 International Mechanical Engineering Congress and Exposition*, November 3-9, 2015 Huston, TX
10. Naresh Poudel, Melvin Kennard, Jiajun Xu, "Experimental Study of Thermophysical Properties of Self-Assembled Water/Polyalphaolefin Nanoemulsion Fluids", *ASME 2014*

International Mechanical Engineering Congress and Exposition, November 3-9, 2015
Montreal, Canada

11. Jiajun Xu, Bao Yang, "Pool Boiling Characteristics and Critical Heat Flux of Water/AOT/Polyalphaolefin Nanoemulsion fluids and their dependence upon water/AOT molar ratio and subcooling effect", ASME Summer Heat Transfer conference 2012, July 2012
12. Jiajun Xu, Bao Yang, "Thermophysical Properties and Pool Boiling Characteristics of Water in Polyalphaolefin Nanoemulsion Fluids", ASME 2012 3rd Micro/Nanoscale Heat & Mass Transfer International Conference
13. Jiajun Xu, Xinan Liu, Bao Yang, "Thermophysical Characteristics of Self-Assembled Ethanol/Polyalphaolefin Nanoemulsion Fluids" ASME 2009 International Mechanical Engineering Congress and Exposition, Volume 9, 2009
14. Jiajun Xu, Zhang, Y., and Ma, H. B., "Liquid-Vapor Oscillating Flow and Heat Transfer in a U-Shaped Minichannel with Internal Wick Structure," ASME 2nd Micro/Nanoscale Heat Transfer International Conference, Shanghai, December 18-21, 2009
15. Jiajun Xu, X.N. Liu, T. Tran, Bao Yang, "Thermal and phase change characteristics of self-assembled PAO nanoemulsion fluids" ASME 2nd Micro/Nanoscale Heat Transfer International Conference, Shanghai, December 18-21, 2009

Federal Grants and Research Funding:

FEDERAL FUNDS AWARDED as PI: ~ \$902,000

NON-FEDERAL FUNDS: ~\$54,000

FUNDING	GRANTS	ROLE IN THE GRANT	FUNDING DURATION	
			START	END
\$300,000	National Science Foundation: Experimental and Multiscale Simulation Study of Nanoscale Thermal Transport and Evaporation/Boiling Heat Transfer using Self-assembled Nanoemulsions	PI	2016	2019
\$500,000	Department of Defense, Major Research Instrumentation Grant: Acquisition of a Laser Rapid Manufacturing System, BEAM: Broadening Education through Advanced Manufacturing at UDC	PI	2016	2017
\$60,000	United States Department of Agriculture: Development of A Novel Stormwater Runoff Collection and Treatment System with hybrid mesoporous materials with nanoparticles	PI	2016	2019
\$42,000	Office of Naval Research: Faculty Research	PI	2015	2017

Fellowship				
\$ 11,000	Deployment and Implementation of NASA Space Challenge On Human Exploration Rover at UDC (Project: DISCOVER)	PI	2017	2017
\$ 6,500	Development of a multiscale atomistic-continuum (MAC) model for nanoscale thermal transport	PI	2016	2016
\$ 5,000	Design and Development of Non-point Stormwater Runoff Collection and Treatment System for Urban Agriculture and Food Security	PI	2015	2015
\$ 1,500	Myrtilla Miners Fellow Program	PI	2015	2015
\$10,000	Development of a portable Stormwater Runoff Collection and Treatment System	PI	2016	2017
\$10,000	A Novel Water Treatment Solution Using Hybrid Mesoporous Materials Embedded with Metallic Oxide Nanoparticle	PI	2015	2016
\$10,000	Water Pollution Prevention and Removal Using Nanostructured Smart Fluid with Switchable Surfactants	PI	2015	2016
Neutron Beam Time	NIST Center for Neutron Research: award of 3 days of neutron beam time to conduct nanotechnology research for twice	PI	2013	2015

**Grant by NIST Center for Neutron Research cover the cost of running the proposed experiment by Dr. Xu for 6 days in total (3 days each time), which include the cost of using nuclear reactor, scientist, laboratory for sample preparation and equipment.

In addition, I have a total amount of over \$9 million worth of funding request as pending with National Science Foundation, Department of Defense and Department of Commerce as shown below:

GRANT PROPOSALS SUBMITTED AND ARE NOW PENDING: ~ \$9 million

FUNDING	GRANTS	ROLE IN THE GRANT	FUNDING DURATION	
			Start	End
\$500,000	National Science Foundation CAREER: Experimental and Multiscale Simulation Study of Nanoscale Phase Change Heat Transfer for Scalable and Smart Thermal Management	PI	2018	2022
\$600,000	Department of Defense, HBCU/MI: Experimental and Simulation Study of Multi-Scale Interfacial Thermal Transport for Scalable and Smart Thermal Management	PI	2018	2021

\$150,000	Department of Defense, Office of Naval Research STEM program: Defense Research Experience and Apprenticeship for Minorities in STEM (DREAMS) Project at the University of the District of Columbia	PI	2017	2018
\$200,000	Air Force Research Laboratory Diverse Collegiate R&D Collaboration Program: Nano-enhanced Phase Change Material and Loop Heat Pipe Enabled Hybrid Thermal Management of Electromechanical Actuator	PI	2018	2020
\$200,000	Department of Energy: Workforce Development in the Advanced Manufacturing at UDC	Co-PI	2017	2018
\$150,000	MSI STEM Research and Development Consortium: Design and extending the capability of Gun Launched 40mm Hybrid Projectile	Co-PI	2018	2019
\$7,454,000	Department of Commerce: Professional Research Experience Program at the University of the District of Columbia (PREP-UDC)	Co-PI	2017	2027

Research and Teaching Capacity Building:

Multiscale Thermal Transport and Energy Conversion Laboratory (42-C10A)

Spent efforts for three years (2013-2016) for establishing this lab. These efforts include designing the lab layout from the scratch, coordinating utility installation and modification to the room, acquiring ~ \$300,000 federal funding for bring research equipment, and setting up the research equipment.

Advance Manufacturing Laboratory (42-C13)

Dean. Shetty initiated the lab and I led the effort to secure the federal funding (~\$500,000) and procure the state-of-the-art Metal-based laser additive manufacturing system (EOS M280). Efforts include the negotiation with different vendors to make the instrument fit into the budget (the system has a market value over \$ 1million), added additional warranty coverage (\$200,000 value with no additional cost to the university), organizing meetings to finalize the vendor, and managing the delivery, site preparation and installation & training. The whole process takes over one year and numerous hours. *This system will allow UDC faculty and students to have access to the first metal-based 3D printing system among all Washington metropolitan area universities, and the capability to perform cutting edge research in additive manufacturing.* It can support senior design projects, class projects, student competitions, summer programs for high schools and high school teachers etc.

Thermal-fluid laboratory (42-C08)

Assisted the modernization of the thermal-fluid laboratory by acquiring a modern convective heat transfer testing station, refurbish the existing conduction and boiling test systems and controlling modules to working condition, updated the controlling software. It can support thermo-fluid laboratory courses, senior design projects, class projects, student competitions, summer programs for high schools and high school teachers etc.

Engineering Measurement laboratory (32-C04A)

Led the modernization of the Engineering Measurement laboratory by configuring a modern measurement testing station, refurbish the existing test systems and measurement modules to working condition, designed new test systems controlled using LabVIEW software for enhanced student active learning. It can support Engineering Measurement lecture and laboratory courses, class projects, student competitions etc.

Major research achievements at UDC from 2013-2017

For the first time studied the multi-phase heat transfer properties of nanostructured materials inside minichannels by developing an automated convective heat transfer test loop at UDC

- [1] Jiajun Xu, Trinh Vu, Thanh N. Tran, "Single-phase flow and heat transfer characteristics of ethanol/polyalphaolefin nanoemulsion fluids in circular minichannels", International Journal of Heat and Mass Transfer, Volume 113, 2017, Pages 324-331
- [2] Jiajun Xu, Trinh Vu, "An Experimental Study on Flow and Heat Transfer Characteristics of Ethanol/Polyalphaolefin Nanoemulsion Flowing Through Circular Minichannels", Nanoscale Research Letters, (2017) 12: 216.
- [3] Jiajun Xu, Fana Zewede, Henok Argaw, Thanh Tran, "Convective Heat Transfer of Ethanol/Polyalphaolefin Nanoemulsion inside Circular Minichannel Heat Exchanger", ASME 2017 Summer Heat Transfer Conference, July 9-14, 2017, Bellevue, Washington, USA
- [4] Naresh Poudel, Musa Acar, Thanh Tran, Jiajun Xu, " An Experimental and Numerical Study of Convective Boiling of Nanoemulsion inside Mini-channels Heat Exchanger" ASME International Mechanical Engineering Congress and Exposition, IMECE 2016, November 2016, Phoenix, AZ, USA

For the first time highlighted the fundamental physics of nucleation phase change process of nanostructured materials using a customized high-speed imaging system at UDC. It can provide meaningful insights on the fundamental physics controlling nucleation heat transfer inside complex fluids

- [1] Jiajun Xu, Robert Stephenson, Cyree Beckett, "Nucleate Boiling Bubble Dynamics Study of Ethanol/PAO Nanoemulsion using Synchronized High-Speed Video and Infrared Thermometry", ASME International Mechanical Engineering Congress and Exposition, November 3-9, 2017, Tampa, FL, USA
- [2] Jiajun Xu, Robert Stephenson, "Synchronized High-Speed Video and Infrared

Thermometry Study of Bubble Dynamics during Nucleate Boiling of Nanoemulsion”, ASME 2017 Summer Heat Transfer Conference, July 9-14, 2017, Bellevue, Washington, USA

[3] Fangyu Cao, Ying Liu, Jiajun Xu, Yadong He, B. Hammouda, Rui Qiao, Bao Yang, "Probing Nanoscale Thermal Transport in Surfactant Solutions", Scientific Reports 5, Article number: 16040 (2016)

For the first time studied the water treatment using a novel nanostructured material to provide a commercial viable and versatile solution that can benefits millions of people across the world

[1] Jiajun Xu, Trinh Vu, Tolessa Deksissa, "Development and characterization of a hybrid mesoporous material infused with metallic oxide nanoparticles for water treatment", Nanomaterials and Nanotechnology, 2017 Volume 7: 1–8

[2] Trinh Vu, Highqueen Sarpomah, Michael Kamen, Tolessa Deksissa, Jiajun Xu, "Nanoparticles Infused Mesoporous Material for Water Treatment Processes", ASME International Mechanical Engineering Congress and Exposition, November 3-9, 2017, Tampa, FL, USA

Developed the ground-breaking multiscale modeling tools, which can be used to model atomic to macroscopic phase change process in one software at high accuracy

[1] Jiajun Xu, Kent Harrison, " A hybrid multiscale modeling tool for simulating phase change heat transfer inside nanoemulsion heat transfer fluid", International Journal of Heat and Mass Transfer, under review

Invention disclosure and provisional patents filed to US Patents and Trademark Office:

- o Novel Working Pairs for Absorption/Adsorption Refrigeration and Heat Pump
- o Hybrid Mesoporous material for water pollutions treatment

Research achievements from other institutions

Developed and characterized a novel Nano-enhanced heat transfer fluid for next generation thermal management solutions. At UDC, I am exploring advanced form and fundamental aspects of this research

[1] Jiajun Xu, Bao Yang, "Nanostructured Phase Changeable Heat Transfer Fluids", Nanotechnology Reviews. De Gruyter, Volume 2, Issue 3, Pages 289–306. 2013

[2] Jiajun Xu, Bao Yang, Boualem Hammouda, "Thermophysical Properties and Pool Boiling Characteristics of Water in Polyalphaolefin Nanoemulsion Fluids", ASME Journal of Heat Transfer, 135(9), 091303, 2013

[3] Jiajun Xu, Bao Yang, Boualem Hammouda, "Thermal conductivity and Viscosity of Self-assembly Alcohol/Polyalphaolefin Nanoemulsions" Nanoscale Research Letters, 2011, 6:274

[4] Chunwei Wu, Tae Joon Cho, Jiajun Xu, Donggeun Lee, Bao Yang, and Michael R. Zachariah, "Effect of nanoparticle clustering on the effective thermal conductivity of

concentrated silica colloids" Physical Review E 81, 011406, 2010

[5] Jiajun Xu, Bao Yang, "Thermal and Phase Change Characteristics of Self-Assembled Ethanol/Polyalphaolefin Nanoemulsion Fluids", Journal of Thermophysics and heat transfer AIAA, Vol.24, No.1, January–March 2010

Invented a novel wick structured oscillating heat pipes and performed the first modeling and simulation of the performance of this unique system. Also, directed the design and manufacture of wick structured oscillating heat pipes for futuristic energy transport and recovery system. At UDC, I am furthering this research to support renewable energy and sustainability research

[1] Jiajun Xu, Yuwen Zhang, and Hongbin Ma., "Effect of Internal Wick Structure on Liquid-Vapor Oscillatory Flow and Heat Transfer in an Oscillating Heat Pipe," ASME Journal of Heat Transfer, Volume 131, Issue 12, 121012, 2009

[2] Jiajun Xu, Yuwen Zhang, "Analysis of Heat Transfer during Liquid-Vapor Pulsating Flow in a U-Shaped Miniature Channel" Journal of Enhanced Heat Transfer, 16(4), 2009

Engaging students in research projects

1. Robert Stephenson*, Cyree Beckett*, Fana Zewede*, Henok Argaw*, Trinh Vu*, Naresh Poudel*, Musa Acar*, Kent Harrison
NSF funded project: Synchronized High Speed Video and Infrared Thermography Study of Phase Change Nucleation inside Nano-enhanced Fluids
Output:
 - Published number of journal papers and peer reviewed conference papers.
 - Sent students to international and local conferences.
 - Two students won two prestigious travel awards to attend the conference and present their research results
 - Two students applied the internships at Navy research laboratories and got accepted into the program
2. Fana Zewede*, Henok Argaw*, Trinh Vu*, Naresh Poudel*, Melvin Kinnard
ONR funded project: Study of Convective Heat Transfer of Nano-enhanced fluids inside micro-channels
Output:
 - Published number of journal papers and peer reviewed conference papers.
 - Sent students to international and local conferences.
 - Deepened collaboration with Navy researchers and invited proposals for continuous funding support
3. Highqueen Sarpomah, Michael Kamen, Musa Acar*, Erika Spangler, Robert Stephenson*, Trinh Vu*
NIFA funded project: development and characterization of a novel mesoporous

nanoparticle infused material for polluted water treatment

Output:

- One student won a prestigious paper competition for 2017 best Engineering and Architectural Students Paper Competition in The National Capital Region Sponsored by The District of Columbia Council of Engineering and Architectural Societies (DCCEAS), and the student received cash reward.
- Published one journal paper in "Nanomaterials and Nanotechnology", and three peer reviewed conference papers/presentations.
- Sent students to local conferences to present their results
- Supported one capstone thesis

4. Zhacary Nokes, Melvin Kinnard, David Lesley, Jote Jinfessa, Mheeraw Kennedy, Khaled Ben Tekaya, Steven Cale, Pat Jucelin Djangjo

WMATA funded project: to modernize the driving train system used in WMATA underground escalator system

Output:

- Supported four capstone theses
- The results were reported in local newsletter:
<http://www.foresthillsconnection.com/news/udc-engineering-students-propos-e-fix-metro-escalator-fixes/>
- Developed a prototype system and the proposed solution is being adapted by WMATA in fixing their escalator system

5. Victor Ramos, Jaime Rios, Netra Simmons, Cyree Beckett, Victoria Church, Jelani Guise, Ernesto Reyes

NASA Space Grant funded project: to design and build a human-powered rover for NASA Annual International Rover Challenge

Output:

- Supported 7 undergraduate students from various disciplines
- Designed and is now developing a prototype system for field testing

6. Three Summer Faculty Incentive Grant Research projects with several students involved

7. Six XEROX research projects with numerous students involved

Student with * engaged in multiple projects

Partnership with other institutions and research laboratories:

1. Partnership with DC area National Laboratories
 - National Institute of Standards and Technology (NIST)- Dr. Boualem Hammouda,

- Dr. Gerard Henein, and Dr. Lei Chen
- Naval Surface Warfare Center- Carderock division (NSWC-CD)- Dr. Thanh Tran
- NASA- Dr. Marilyn H. Lewis

2. Partnership with University of Maryland- Baltimore County
 - Co-advising a Ph.D student and former UDC graduate, Naresh Poudel on his Ph.D. thesis work
3. Partnership with University of Missouri:
 - Collaboration on improving the simulation accuracy at nanoscale level by developing a multiscale model
4. Consortium of Advance Manufacturing:
 - I am serving as an outreach representative for UDC and working with the PI, Dr. Tyagi and a group of eight universities (Such as Howard, Hampton, North Carolina A& t, Clark Atlanta, Alabama A&M, Lincoln) and three Department of Energy manufacturing and research units (Kansas City Plant, Y12, and Oak Ridge National Laboratory)

Awards and Distinctions

1. 2016 School of Engineering and Applied Sciences' Excellence in research award during annual recognition
2. 2017 Office of Naval Research Faculty Research Fellowship
3. 2016 Office of Naval Research Faculty Research Fellowship
4. 2015 Office of Naval Research Faculty Research Fellowship
5. 2012-2013 A. James Clark Future Faculty Program Fellowship
6. Research on Nano-enhanced heat transfer fluids was highlighted in high impact peer-reviewed journals
7. Won travel awards to attend:
 - NASA rover challenge workshop in 2017
 - NCEES Mechanical Engineering Cut-Score Workshop in 2017
 - QEM NSF/HBCU-UP Proposal Development Workshop in 2015
 - INCREASE Workshop at Brookhaven National Laboratory in 2014
 - ASME summer heat transfer conference in 2013

Memberships and other affiliations:

2015-2017	Office of Naval Research faculty research fellow
2017-present	Topic organizer: ASME International Mechanical Engineering Congress and Exposition
2015-2017	Editor, Journal of Engineering Science & Research Technology
2016-present	Maryland Board of Professional Engineers, Mechanical Engineering Discipline
2008-present	Member of American Society of Mechanical Engineering
2016-present	Member of American Society of Engineering Education
2008-present	Life Member of Society of Asian Engineers
2012-present	Certified LabVIEW developer
2011-present	Certified External user of Center for Neutron Research, NIST, Gaithersburg
2015-present	Certified External user of Center for Nanoscience and technology, NIST, Gaithersburg

Teaching Activities

- 1. At UDC I taught the following courses: Engineering Measurements Lecture and Laboratory, Analysis and Synthesis of Machinery, Heat Transfer, Senior Capstone I & II covering from Sophomore to Senior level**
- 2. Dr. Shetty initiated and I assisted in introducing industrial-sponsored senior capstone projects to UDC students since I joined UDC in 2013**
- 3. Introduced state-of-the-art computer-aided modeling, simulation and data acquisition software to various courses, which include: ANSYS, LabVIEW, Matlab, Working Model 2D to better equip UDC students for competitive job market and/or pursuing an advanced degree in STEM.**
- 4. Co-supervised one Ph.D. student of University of Maryland-Baltimore County and former UDC graduate, Naresh Poudel, in Computational modeling of Evolution of Vortex Structures over Flapping Foils in Shear Flows and Its Impact on Aerodynamic Performance**
- 5. Developed and is implementing "Introduction to Nanotechnology" module to UDC TRiO program to DC high school students**

Training in effective teaching:

Date	Title	Sponsors
July, 2017	Myers Briggs Assessment for effective teaching and mentorship	UDC STEM Center Dr. Dixon and Ms. Wood
April 13, 2017	Grand Challenge Scholar program	Dr.R. Bindiganavale, Director National Academy of Engineering (NAE)
Sep. 16. 2016	Active Learning Course Design Workshop	UDC RAIL/ Dr. Tyagi
Aug. 19. 2016	Blackboard Collaborate Ultra Essentials Workshop	Research Academy for Integrated Learning
Aug. 18. 2016	Checks and Balances in Online/Hybrid platforms Workshop	Research Academy for Integrated Learning
Aug. 18. 2016	Foundation Directory Online: Finding Funds to Support Research Projects Workshop	Research Academy for Integrated Learning
Aug. 19. 2016	Teaching with Archives to Research 21st Century Students Workshop	Research Academy for Integrated Learning
July 15, 2016	Inquiry Based Learning	Dr. Ivana Milanovic, Professor of Mechanical Engineering, University of Hartford, Connecticut
Sep.8, 2015	Problem Based Learning in the Engineering Curriculum: implementation, Benefits and Challenges	Dr. Sanjeev K. Khanna University of Missouri, Columbia, MO
July 2015- August 2015	Myrtilla Miner Faculty Fellowship for Effective Teaching	UDC/Coordinator Dr. Carl Moore and Dr. Morris Thomas
June 23-25, 2014	Railway Engineering Education Symposium (REES)	AREMA Educational Foundation

Practices in experiential effective teaching:

Motivations of applying experiential effective teaching
<p>Active learning approaches require a lot of time investment in student activities and engagement during the class period, which often leads to incomplete coverage of the course syllabus. Furthermore, it requires significant amount of time for the instructor to design and implement active learning strategies. All these shortcomings are often cited as the common hindrance in adopting student active learning.</p> <p>In addition, based on our ABET accreditation self-assessment and discussion with Advisory Board members, the critical thinking, technical writing and communication skills are highly desired but not yet well-equipped among many college graduates.</p>
Core Elements of experiential effective teaching

To address these widely recognized inhibiting factors and provide a better experiential effective learning experience to UDC students, I recently designed and implemented a new student active learning approach. This approach is aimed to engage student prior to coming to lecture, during the lecture and after the lecture, and it consists of two main approaches:

1. The main lecture part will be based on the students' presentation and peer instruction
2. Projects supported problem solving practices with computer-aided design/modeling
3. Field visit/life experience based learning

Specifically,

the students' presentation and peer instruction consists of the following elements:

- Students are given a reading assignment to prepare a PowerPoint presentation on well-defined conceptual topics, questions, or chapter modules.
- Reading assignments on a topic are administered 1-2 weeks before covering them in the class. This allows reasonable time for the self-comprehension of the suggested material for presentation preparation.
- Students were expected to rehearse the presentation and be prepared to complete it in the suggested time duration.
- During each lecture, one group of students would present the assigned topic to the class, and their presentations were graded according to the rubric focusing on the coverage of suggested topics, quality of presentation, and after presentation discussions.
- Peers and instructor provided feedback about the students' presentation and unclear concepts.

the Projects supported problem solving practices with computer-aided design/modeling consists of the following elements:

- Students are given a combination of group and individual projects which spans from a few weeks to semester long
- Each project is designed to integrate one or two core elements of the course so that students can practice and mature their problem-solving skills
- Each project is designed to integrate with computer-aided design and modeling tools for students to practice their skills and to better meet the requirements of the 21st century
- Students are required to report their results on these projects in professional-formatted written reports to improve their technical writing skills

the Field visit/life experience based learning consists of the following elements:

- Students are taken to course-related places to have a field trip, which includes National Institute of Standards and Technology, and Escalator laboratory at WMATA
- Guest speakers are invited to classroom and to share their experience with the students
- Collaborate with local entrepreneurs to offer real-life challenges to the students to solve
- Real-life examples, videos, and pictures are used to motivate students and encourage them to apply their knowledge to contribute to the society

Assessment of the experiential effective teaching method

To assess the efficacy of this approach, the study is qualitative with two methods:

- direct evaluation and assessment of the teaching practices of the students
- anonymous surveys of student participants

This study is designed to collect evidence on how students who participate in the effective teaching practices have bettered their understanding of the course materials through active learning. Also, included are perceptions of the students taught using this method through the anonymous survey conducted online.

Results of implementing the experiential effective teaching method

Based on the feedback collected through this anonymous survey, it has clearly indicated the advantages of implementing the experiential effective teaching approach that it can engage students and foster active learning (the results have been published in peer-reviewed conference publications)

- over 90% the student participants highly valued this practice and 10% think this practice is helpful
- the following observations will be incorporated to my future teaching practice: 1. incorporate a mini-review session at the end of each lecture; 2. regroup the students every a few presentations; and 3. Incorporate more modeling based projects

Supported the undergraduate concentrations, biomedical engineering, and Master of Science program in Mechanical Engineering department:

1. Prepared and coordinated the submission of Master of Science program proposal in Mechanical Engineering department
2. Supervise senior capstone projects for both Mechanical, electrical and biomedical engineering students
3. Proposed new courses for the Nanotechnology, Energy and Additive Manufacturing tracks in the MSME curricula
 - MECH 531 3 Intermediate Heat and Mass Transfer
 - MECH 532 3 Engineering Numerical Modeling Methods
 - MECH 533 3 Engineering optimization
 - MECH 534 3 Failure Mechanism and Reliability
 - MECH 535 3 Nano-to-Macro Transport Processes
4. Developed laboratory for additive manufacturing, energy concentrations in mechanical engineering and biomedical engineering curricula
 - a. Multiscale thermal transport and energy conversion laboratory
 - b. Metal-based laser additive manufacturing system (EOS M280 3D printer) for biomedical device and implant education

c. Thermal-fluid laboratory modernization

Discovering new effective teaching strategies:

1. In Fall 2015 and Spring 2016, developed and implemented "student presentation based active learning for senior level courses in ME". This has addressed the shortcomings that are often cited as the common hindrance in adopting student active learning
2. The discovery was accepted in *ASME International Mechanical Engineering Congress and Exposition*, Nov 3-9, 2017, Tampa, FL, USA
3. The discovery of the impact of this active teaching approach on other UDC faculty and various courses has been published in a joint-publication with other UDC faculties and Myrtilla Minor fellows at 63rd National Conference, February 16-18, 2017 Durham, North Carolina. Collaborators: Drs. Morris Thomas, Carl Moore of RAIL, UDC and Drs. Pawan Tyagi, Sasan Haghani, Lara Thompson of SEAS UDC.
4. On-going research in effective teaching:
 - a. Conducting research on the adapting this method to junior level technical intensive courses such as: Analysis and Synthesis of Machinery, and Heat Transfer
 - b. Conducting research on how the class size and different culture backgrounds of the students affect the implementation of this method

Promoting STEM education for high school teachers and students at UDC:

1. Hosted and supervised 8 high school students under DC Mayor Marion S. Barry Summer Youth Employment Program (SYEP) program for a period of 10 weeks (June~ July 2017)
2. Conducted hands-on workshop on multiscale thermal transport and energy conversion for ~30 middle/high school students and teachers on March 10th 2017 during Science Discovery Day
3. Provided guided tour and workshop to multiscale thermal transport and energy conversion laboratory, and additive manufacturing laboratory for ~25 high school students and teachers on February 21, 2017 during Discover Innovation Day
4. Presented the research and education capability in Nanotechnology and energy areas to ~25 high school teachers on July 20, 2015, during American society of Metals camp at UDC
5. Provided guided tour and workshop to multiscale thermal transport and energy conversion laboratory, and additive manufacturing laboratory for ~70 high school students and teachers on March 11, 2016 at Career Night at UDC event
6. Participant of the "Solutions for STEM Diversity: Lessons from HBCUs and other Leaders in

Diversifying the Pipeline”, National Academies of Sciences, Engineering, and Medicine, Washington, DC (Feb. 2016)

Service

Service to the department:

Dates	Activity
Oct 1, 2015-present	<ul style="list-style-type: none"> • Led the efforts to prepare and submit the instrumental grant proposal to acquire a state-of-the-art metal 3D printing system to support the curricular and extra-curricular activities • Coordinated several committee meetings to discuss and finalize the vendor and options for the 3d printing system • Prepared supporting documents for procurement, and coordinated the procurement and delivery of the system to the Additive Manufacturing laboratory
2013- 2017	Member of the Mechanical Engineering DEPC
Spring 2017	Sought out Adjunct Professor to teach one ME course
Spring 2017	Advised and mentored new Adjunct Professor in ME course
2013- 2017	Designed and developed the brand-new Multiscale thermal transport and energy conversion laboratory
Spring. 2015-Fall. 2015	Coordinated the preparation and submission of Master’s of Science in Mechanical Engineering proposal
2013- 2016	Contributed in modernizing the thermal-fluid laboratory
August 15, 2013- May 15, 2015	Evidence based teaching for the preparation of Accreditation Board for Engineering and technology (ABET) visit in 2014
May, 15 2015-present	Evidence based teaching for the preparation of Accreditation Board for Engineering and technology (ABET) visit in 2020
2013-present	Advised industrial sponsored senior capstone projects in ME, EE and BME
2013-present	Assisted multiple UDC SEAS students with grad school, summer internship and fellowship applications
2013-present	Wrote recommendations for UDC SEAS students
2013- 2015	Contributed in mechanical engineering lab space organization and planning
2014- present	Founded the first American Society of Heating, Refrigerating and Air-Conditioning Engineers Student Chapter at UDC, and served as a Staff advisor by coordinating guest speakers to UDC and providing Internship/Job

	opportunities for UDC students
15 August 2013 - present	Recruitment activities: attended the recruitment events at UDC campus, DC Convention center, UDC student center, Robotics competition, and Maker fair at UDC
15 August 2013- present	Websites for ME: prepared material for current and future student section. Prepared research profile, recourse list, and lab posters

Service to school:

Dates	Activity
Fall 2017	Supported and presented at the 2017 Advancing Minorities' Interest in Engineering (AMIE) Conference hosted by UDC and SEAS
Oct 1, 2016 -present	Led the efforts to prepare and submit the instrumental grant proposal to acquire a state-of-the-art metal 3D printing system to support the curricular and extra-curricular activities, which can support the recruitment of good academic standing students to pursue a STEM related degree, and attract faculty researchers in related areas to join SEAS
Spring. 2017	Assisted in the preparation of the doctoral program in SEAS
Spring 2017	Served at the Micheal G. Bennett Memorial Scholarship Committee
Fall 2013-present	Assisted UDC SEAS, including ME students with internship applications
Fall 2013-present	Assisted UDC SEAS, including ME students with grad school applications
Fall 2013-present	Mentored multiple UDC undergraduate students with internal (UDC) research experiences and also toward external internship awards
February 21, 2017	Provided guided tour and workshop to multiscale thermal transport and energy conversion laboratory, and additive manufacturing laboratory for ~25 high school students and teachers during SEAS Discover Innovation Day
March 21, 2017	Organized a talk by Mark Smith and Ron Garraffa from HDR Consulting to talk about "Engineering Consulting" and career opportunities
November 2, 2016	Organized a talk by, Alfred O. Uzokwe Jr. and Micheal Spencer on Seminar on Internships, Scholarships and Job opportunities in various engineering fields
May 3, 2016	Organized a talk by, Raj Setty, President & Principal from Setty & Associates International, PLLC to talk about "Case Study: Engineering one of the world's largest net zero schools".
March 29, 2016	Organized a talk by, Jesse Fisher, Sr. Mechanical Engineer at WB Engineers+Consultant

Fall 2015-present	Complied multi-page list of scholarly publications and activities to UDC SEAS report
November 5, 2014	Organized a talk by, Mary Opalka and Mikelann, Mechanical Engineer at McKinstry, Spokane, WA
2013-2014	Member of Faculty Search Committee and contributed in the selection of one civil engineering faculty

Service to university:

Dates	Activity
Spring 2017 -present	<ul style="list-style-type: none"> • Initiator and supervisor of the first UDC team for NASA Human-powered Rover International Challenge • Prepared and submitted funding request for supporting the project • Coordinated the collaborative project with DC high schools • Co-supervised 8 DC high school students on the rover project • Attended the workshop for NASA Human-powered Rover International Challenge
2016-present	Serving as a steering committee member of UDC STEM center and faculty mentor to UDC students enrolled in STEM disciplines
March 10 th 2017	Conducted hands-on workshop on multiscale thermal transport and energy conversion for ~30 middle/high school students and teachers during Science Discovery Day
November 25, 2016-December 16, 2016	Served as a reviewer for the DCWRRRI seed grant proposals: reviewed 12 proposals and provided detailed feedback on the technical merits of the proposals
2016-present	Volunteering the time to design the short course for the UDC TRiO program, and serving a faculty instructor to introduce nanotechnology to local high school students who are targeted as future UDC students
15 August 2016 – present	Attended all the professional development weeks, opening convocation and university-wide events
March 11, 2016	Provided guided tour and workshop to multiscale thermal transport and energy conversion laboratory, and additive manufacturing laboratory for ~70 high school students and teachers during Career Night at UDC event
June-Aug. 2015	Myrtilla Miner Faculty Fellowship (awardee and Workshop Participant)

Service to community:

Dates	Activity
Oct 1, 2016 - present	<ul style="list-style-type: none"> • Serve the National Professional Engineers Community by contributing time and expertise in modernizing the exam and licensure procedures • Attended the mechanical engineering cut-score workshop (~14 hours) at Greenville, NC • Assisted in setting the PE exam standards to the next 7~10 years
June, 2017- July, 2017	Supervised 8 high school students under DC Mayor Marion S. Barry Summer Youth Employment Program (SYEP) program for a period of 10 weeks
	Served as a judge of Science day event at Montrose Christian School
May 18, 2017	Served as a judge of Senior Engineering Presentation event at McKinley Technology High School
April 30, 2017	Served as a judge of STEM Fair held at Washington YuYing Public Charter School
2013- 2017	Reviewers for numerous journals and conferences, which includes but not limited to: ASME journal of heat transfer, Applied Thermal Engineering, Nanoscale and Microscale Thermophysical Engineering, Nano Energy, and several ASME conferences.
July 20, 2015	Presented the research and education capability in Nanotechnology and energy areas to ~25 high school teachers during American society of Metals camp at UDC
Feb. 2016	Participant of the "Solutions for STEM Diversity: Lessons from HBCUs and other Leaders in Diversifying the Pipeline", National Academies of Sciences, Engineering, and Medicine, Washington, DC