



**Approval Form for
New Graduate Degrees**

Date: October 13, 2015

Originating Department or Program: Mechanical Engineering

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Proposed Degree (Level and Title): Ph.D. in Mechanical Engineering with Dissertation
in Intelligent Energetic Systems

Proposed date to admit new students: Fall 2016

Attach proposal in approved format

Approvals:	Signature	Date
Department Chair		5 Nov 2015
Graduate Council		10/13/15
Faculty Council		5 Oct 2015
Vice President for Academic Affairs		11/5/15
Board of Regents		11/30/15
Council of Graduate Deans		
Academic Council for Higher Education		
NM Higher Education Dept.		
NM State Board of Finance		

A proposal for the

Doctor of Philosophy Degree

in

Mechanical Engineering with Dissertation in
Intelligent Energetic Systems

at the

New Mexico Institute of Mining and Technology

October 2015

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Executive Summary

Doctor of Philosophy Degree in Mechanical Engineering with Dissertation in Intelligent Energetic Systems at New Mexico Institute of Mining and Technology

The Department of Mechanical Engineering at New Mexico Institute of Mining and Technology (NMIMT) proposes a new Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. The Ph.D. program is aimed at addressing educational needs of emerging markets in intelligent mechanical systems, explosives engineering, and national security. The purpose of the proposed program is to provide graduate education and training in the mechanical engineering discipline focusing on research, development and practical applications of intelligent systems, energetic materials, and state-of-the-art security practices in private industry and governmental entities. The program explores system engineering thinking, knowledge of energetics, use of innovative design techniques, and cross-disciplinary analysis of system elements for applications in explosives engineering, smart systems and intelligent structures. It is due to the fact that all modern energetic or explosive systems incorporate some form of intelligence and real time analytics that this program represents technological innovation and the next step in explosives science and engineering.

Need for the program comes from diversity of New Mexico business enterprises and growing interest in national security, energetics, and intelligent systems in general. There is no in-state and out-of-state duplication due to specific interconnection between intelligent systems and energetics. In this respect, the program is uniquely positioned to serve students interested in engineering smart/intelligent/adaptronic systems and explosives science.

It is anticipated that the main clientele of the program will consist of recent bachelor or master engineering degree graduates, qualified working professionals, as well as qualified staff members of national laboratories and other governmental entities. Projected full-time and part-time student enrollment for the first 5 years of the Ph.D. program is 14 students. Students will be supervised by a growing number of mechanical engineering faculty with involvement of faculty from other departments and adjuncts. Financial support of the Ph.D. students will mainly come from faculty research and scholarships provided by industry, government, and foundations. The Ph.D. students will also enhance faculty research allowing for more complex topics to be approached. Procedures already implemented for assessment of the existing M.S. program in Mechanical Engineering will be used to evaluate operation and impact of the proposed Ph.D. program.

The program will be administered by the Department of Mechanical Engineering. In addition, it is projected that other departments and NMIMT divisions (e.g. EMRTC) will contribute to program operation. The Mechanical Engineering Ph.D. program with Dissertation in Intelligent Energetic Systems is well aligned with NMIMT's strategic plan and current educational/research directions.

A Purpose of the Program

The Department of Mechanical Engineering at New Mexico Institute of Mining and Technology (NMIMT) proposes a new Ph.D. program in *Mechanical Engineering with Dissertation in Intelligent Energetic Systems* (MENG-IES). The Ph.D. program is aimed at addressing educational needs of emerging markets in intelligent mechanical systems, explosives engineering, and national security.

A.1 The Primary Purpose of the Proposed Program

The purpose of the proposed Ph.D. program in *Mechanical Engineering with Dissertation in Intelligent Energetic Systems* is to provide graduate education and training in the mechanical engineering discipline focusing on research, development and practical applications of intelligent systems, energetic materials, and state-of-the-art security practices in private industry and governmental entities.

The uniqueness of the program is that it explores system engineering thinking, knowledge of energetics, use of innovative design techniques and cross-disciplinary analysis of system elements for applications in explosives engineering, intelligent structures, energetic effects and smart systems. It is due to the fact that all modern energetic or explosive systems incorporate some form of intelligence and real time analytics that this program represents technological innovation and the next step in explosives science and engineering.

Modern engineering systems are truly multidisciplinary. They feature synergistic integration of chemical and mechanical functions with electronic components, embedded computational cores, information inference algorithms, and communication links for real-time autonomous functionality. The demand for intelligent engineering systems is dynamically expanding as government and consumers alike consider buying a new generation of systems and products with microcontrollers and sensors structurally integrated to enable unprecedented performance, reliability, and safety. Examples of these household technological innovations include advanced garden irrigation systems adaptable to weather conditions, programmable house climate control devices, and other products with mechanical functionality enhanced by ability to sense and adapt to operation environment. However, intelligent mechanical systems are not only consumer oriented. Governmental organizations and industry have well-documented use and increasing need of mechanical systems with built-in intelligence. Such systems enable mankind to expand the scientific exploration beyond the planet to the Moon and Mars and permit broader use of alternative, including nuclear, energy sources. It is intelligent systems that assist in defending this country and promoting free societies.

The defense-related applications require an extensive knowledge of energetic materials and shock physics. These subjects are the core of explosives science. However, to design and build energetic systems for both civic and defense applications, knowledge of mechanical engineering is crucial as it implies achieving a concerted operation of mechanical,

electrical, software and energetic components – i.e. system level intelligence. It is difficult to find a successful engineering system lacking integration of mechanical actions, electronic control, information processing and decision making at least at some level. This is especially true for energetics.

As these smart, adaptronic, and self-sustainable devices grow in complexity and in the levels of civic, scientific and defense tasks they perform, it is of paramount importance to educate a new generation of mechanical engineers on a broad spectrum of issues pertaining to the design, realization, maintenance and safe retirement of such systems. This is the primary purpose of the proposed Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems.

A.2 Consistency of the Proposed Program with the Role and Scope of the Institution

The Doctor of Philosophy program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems is consistent with NMIMT’s mission and strategic plan¹. The NMIMT’s mission indicates the following central aspects pertaining to the role and scope of the institute:

“New Mexico Tech serves the state and beyond through education, research, and service, focused in science, technology, engineering, and mathematics. Involved faculty educate a diverse student body in rigorous and collaborative programs, preparing scientists and engineers for the future. Our innovative and interdisciplinary research expands the reach of humanity’s knowledge and capabilities. Researchers, faculty, and students work together to solve real-world problems. Our economic development and technology transfer benefit the economy of the state and create opportunities for success. We serve the public through applied research, professional development, and teacher education, benefitting the people of New Mexico.”

The NMIMT mission emphasizes science, technology, engineering, and mathematics, which constitute the core of the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. Design and development of modern mechanical engineering systems prepares students to tackle “real-world problems” requiring the integration of multifaceted mechanical, electronic, bio, structural, or energetic components into one system. Complying with the NMIMT mission, the program will develop an inclusive multi-disciplinary learning environment focused on “preparing scientists and engineers of the future”. Therefore, the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems is well aligned with the mission of the institute as is indicated in the NMIMT governing documents.

¹ Excerpt taken from the NMIMT 2015-2020 strategic plan:
http://www.nmt.edu/images/stories/presidentsofficepages/NMT_Strategic_Plan_2015-2020_final.pdf

A.3 Priority of the Institution for the Proposed Program

The strategic plan of the New Mexico Institute of Mining and Technology states: “New Mexico Tech aspires to be a preeminent *community of scholars* dedicated to research, education, and innovation – advancing science, technology, engineering, and mathematics – to meet the challenges of tomorrow. We will drive innovation and education through transdisciplinary collaborations.” The Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems is well aligned with this vision and is intended to support its practical realization. Institutional priority for establishing the MENG-IES Ph.D. is reflected in a broad spectrum of the institute’s activities including:

- (a) Traditional focus of NMIMT Mechanical Engineering department on multi-disciplinary research including such areas as Mechatronics, Smart Structures, Traditional/Renewable Energy, and Explosives Engineering.
- (b) Establishment of an M.S. degree program in Mechanical Engineering with specializations in: Explosives Engineering, Mechatronics Systems and Robotics, Fluid and Thermal Sciences, Solid Mechanics. In addition, the B.S. Minor in Explosives Engineering was established in 2007, which is one of two undergraduate explosives programs in the nation.
- (c) Establishment, in 2001, of a Distance Education Master of Science Degree program with annual enrollment of approximately 35 mechanical engineering students.
- (d) During years 2006-2015 engineering departments hired 15 tenure-track faculty members in areas closely matching the scope of the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. One additional hire focusing on explosives chemistry is anticipated this year in the Chemistry department, which will collaborate on MENG-IES Ph.D. program.
- (e) The NMIMT administration has allocated space and other resources to establish additional research labs (11), teaching labs (4), plus 3 Living Learning Communities for freshman students.
- (f) In 2014, NMIMT administration expressed ideas during a Board of Regents meeting of allocating a whole building to house the Mechanical Engineering Department with associated offices, laboratories and teaching auditoriums.
- (g) A number of NMIMT departments have established a partnership with NMIMT’s Energetic Materials Research and Testing Center (EMRTC) on a number of national and international projects within the scope of the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems.
- (h) In the 2015 strategic plan, the establishment of a Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems is listed as the top priority related

to the goal to “grow graduate enrollment to become a Ph.D.-granting institution in 7 to 10 years”, as part of the strategic priority to “Ensure Intentional and Planned Quality Growth”. The NMIMT administration, including the Vice President for Research and Economic Development and the Vice President for Academic Affairs, has indicated the institute’s priority for the MENG-IES Ph.D. program in a number of public speeches to various audiences.

A.4 Curriculum

The Curriculum for the proposed Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems is detailed below. The majority of the coursework will be based on courses currently listed in the catalog.

The prospective doctoral candidate should develop a strong background in energetics, intelligent systems, and fundamental aspects of mechanical engineering. Candidates will also develop the ability to integrate aspects of these fields and apply them to cutting-edge research. Upon completion of the program the student shall exhibit: a) an ability to apply advanced knowledge of mathematics, science, and engineering, b) an ability to identify, formulate, and solve engineering problems, c) an ability to design, document, and conduct experiments, as well as to analyze and interpret data, d) an ability to analyze requirements, propose design and evaluate practical realization of an engineering system, e) an ability to communicate effectively, f) an understanding of professional and ethical responsibility, g) the broad education necessary to understand the impact of engineering solutions in a global and societal context, h) a recognition of the need for, and an ability to engage in life-long learning, i) a knowledge of contemporary (within the profession) issues, j) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Specific programs of study are developed by the student and their advisory committee, subject to the requirements listed below.

Course Requirements:

The student is required to take 72 graduate credit hours beyond the Bachelor’s degree (or equivalent):

- 27 credit hours of core courses (3 courses from each core segment)
- 9 credit hours of elective courses, as approved by the graduate advisory committee
- 3 credits of Graduate Seminar (MENG 585)
- 9 credits maximum of Directed Study (MENG 581 or related 581, must be graded)
- 24 credits minimum of Dissertation research

A student with a Master’s degree in Mechanical Engineering (or closely related discipline) must complete the following minimal requirements of 48 credits beyond the Master’s degree:

- 18 credit hours of core courses (3 courses from Energetics and 3 courses from Intelligent Systems core segments)*
- 3 credits of Graduate Seminar
- 3 credits maximum of Directed Study (MENG 581 or related 581, must be graded)
- 24 credits minimum of Dissertation research

Energetics core segment: MENG 545 Introduction to Explosives Engineering, MENG 546 Detonation Theory, MENG 549 Wave Propagation, MENG 550 Advanced Explosives Engineering, MENG 552 Explosives Technology and Applications, MENG 589 Impact Dynamics, ME 548 Rock Fracturing and Fragmentation by Explosives, CHEM 540 The Chemistry of Energetic Materials.

Intelligent Systems core segment: MENG 544 Modern Control Theory, MENG 548 Manipulator based Robotics, MENG 567 Smart Engineering Systems, MENG 570 Advanced Mechatronics, MENG 572 Sensor Technology, MENG 574 Electrical Measurements of Non-Electrical Quantities, EE 551 Discrete-Time Signal Processing, Filtering, and Estimation, CSE 568 Intelligent Systems.

Fundamental Science and Engineering core segment: MENG 515 Theory of Elasticity, MENG 575 Advanced Engineering Mathematics, MENG 577 Advanced Fluid Mechanics, MENG 578 Advanced Thermodynamics, MENG 579 Advanced Heat Transfer, MATE 530 Design and Analysis of Experiments, PHYS 509 Methods of Theoretical Physics.

Qualifying Examination:

Core competency in mechanical engineering fundamentals must be demonstrated. The qualifying exam will also assess a student's ability to rationally approach novel problems and apply engineering analytical tools. The student will take written exams in three of the following topic areas as selected by the student with approval of the academic advisor.

Exam Topic areas:

- Control theory
- Dynamics
- Thermodynamics
- Fluid dynamics
- Heat transfer
- Mechanics of Materials
- Structural Analysis

* In the case of a student who has completed equivalent courses in the energetics and/or intelligent systems core segments as part of their M.S. degree, the distribution of credits within the core segments may be adjusted (including credits from the Basic Science and Engineering core segment) as determined by the Graduate Advisory Committee.

The exam questions will be written and graded by department faculty members. These exams will be used to evaluate the student's knowledge of mechanical engineering topics at the undergraduate level and their ability to a) apply advanced knowledge of mathematics, science, and engineering, b) identify, formulate, and solve engineering problems.

The exam will be offered shortly after the end of each spring semester. The exam must be first taken before the beginning of the 3rd semester and is subject to the following:

- Students must take exams from three selected topics at the first exam attempt.
- A student who does not pass a topic exam may retake that topic exam (or another topic exam with advisor approval) at the next offering; they do not need to retake exams that they have passed.
- A student who has not passed exams in three topics by the completion of their second exam attempt does not advance, and will leave the program. The student will be able to pursue a M.S. in Mechanical Engineering subject to those degree requirements.

Candidacy Examination:

- Written dissertation proposal
- Presentation of written proposal and oral exam on the proposal and related IES coursework
- Must be taken no fewer than 12 months after passing the qualifying exam
- Three possible outcomes:
 - Pass: Student advances to Candidacy
 - Pass with conditions: 6 month window to correct minor deficiencies; Student advances to Candidacy only after the Graduate Advisory Committee determines deficiencies have been corrected.
 - Fail: Student does not advance to Candidacy and will leave the program.

Publication of Research:

- The student must demonstrate dissemination of research results by publishing at least one article in a peer-reviewed science or engineering journal.

Dissertation & Defense:

- Written Dissertation
- Oral presentation with public and private (committee only) Q&A
- Defense must take place no fewer than 12 months after passing the Candidacy Examination
- Possible outcomes:
 - Pass
 - Pass with conditions: Student must correct minor deficiencies. Note that the deficiencies should be minor and not require a second defense.
 - Fail: Student has not satisfactorily presented/defended their dissertation and will leave the program.

B Justification for the Program

B.1 State and Regional Need

Over the past decade there is an increasing need of engineering professionals in national defense and energy sectors. New government initiatives had a direct impact on number and specialization of professionals entering Sandia National Laboratories, Los Alamos National Laboratory, Space Vehicles and Directed Energy Directorates Air Force Research Laboratory-Kirtland (AFRL-Kirtland), and White Sands Missile Range. Strong connection to national laboratories through joint projects, information exchange and on campus seminars allows NMIMT to be at the forefront of research in areas critical to national interest and intrinsically understand skills and expertise needed for professionals working in such areas. NMIMT has established collaborative programs with the national laboratories that provided students with opportunities not only to visit and to participate in cutting-edge research, but also to understand high levels of professional expertise required for government employees. These efforts have resulted in a substantial number of NMIMT graduates hired by national laboratories and industry closely associated with the labs. For example, needs of the Space Vehicles Directorate of AFRL have prompted collaborative work with NMIMT in the area of smart structures and mechatronics. This lead to a number of internships awarded to mechanical engineering students and a subsequent hire by Space Vehicles Directorate. It should be also mentioned that a number of engineering students were hired by industrial partners of the Space Vehicles Directorate.

NMIMT's undergraduate program in Mechanical Engineering is well known for a rigorous sequence of design courses in which each team of students is working on a project assigned by industry or a national laboratory. This approach to design courses is, perhaps, one of the best ways to understand needs of local New Mexico business. Appendix V lists current projects initiated by the Mechanical Engineering department with local business. These close ties have resulted in many NMIMT Mechanical Engineering graduates finding employment by a wide spectrum of New Mexican companies ranging from large enterprises to small businesses.

With emergence of commercial space transportation, NMIMT is at the forefront of educating professionals to this new industry. With one of first national spaceports, Space Port America, New Mexico is a leader providing commercial space services. NMIMT Mechanical Engineering is among few educational institutions selected to participate in the Federal Aviation Administration (FAA) National Center of Excellence for Commercial Space transportation (CST). In this center, NMIMT has focused on tasks involving smart mechatronics systems and explosives engineering for improving safety and reliability of commercial space vehicles. Through these efforts, for the first time ever, active ultrasonic measurements in near-space and space environment were conducted by students and faculty. NMIMT research also helps FAA to establish guidelines for propellant safety procedures through associated testing at explosives facility in EMRTC. Over past few years, the department has instrumented two payloads flown on two commercial

spaceflights from Space Port America. As New Mexico space activities grow in number and magnitude, NMIMT views itself as one of key state educators of professionals in energetic systems and intelligent structures entering the new commercial space industry.

Testimonials from employees at national laboratories and testing facilities help to articulate their interest in supporting a doctoral program in *Mechanical Engineering with Dissertation in Intelligent Energetic Systems* at NMIMT and underscore the fact that such a program would offer unique education opportunities not offered elsewhere in the state.

“The mission of the NASA/White Sands Test Facility is propulsion systems testing and energetic/hazardous materials evaluation. The addition of a Ph.D. program in Mechanical Engineering at NMIMT capitalizes on unique capabilities and academic knowledge that directly support the site and NASA’s mission. This also opens significant opportunities for advanced collaboration in testing and research on energetic materials.” – *Mark R. Leifeste, Jacobs Technology Inc. NASA/White Sands Test Facility*

“Sandia National Laboratories is always interested in students from New Mexico Tech. In the current capacity NMIMT Mechanical Engineering is only able to provide students at the Master’s level. If a Ph.D. were available Sandia would gladly draw from NMIMT due to their students’ proven track record.” – *Leroy Garley, Sandia National Laboratories*

“A Ph.D. program that included a focus in explosives and energetic systems would greatly benefit our research initiatives here at Los Alamos National Laboratories.” – *Matthew N. Rush, Los Alamos National Laboratories*

B.2 Duplication

In-State

In the state of New Mexico, both University of New Mexico (UNM) and New Mexico State University (NMSU) offer degrees of Doctor of Philosophy in Engineering with variety of concentrations. These degree programs are similar in that they are based in the fundamental discipline of engineering. However, none of the New Mexico universities offer a graduate program with Dissertation in *Intelligent Energetic Systems*. The only graduate program related to this field is MS Mechanical Engineering program with concentrations in Explosives Engineering and Mechatronic Systems & Robotics offered by NMIMT. With the proposed Ph.D. program, NMIMT extends its established expertise and educational services into the Ph.D. level. It is the specialized nature and associated areas of study that differentiate the proposed Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems from other Mechanical Engineering Ph.D. programs in the state. The proposed NMIMT's Ph.D. program specializes exclusively in *Intelligent Energetic Systems* and does not offer any other Mechanical Engineering specializations.

University of New Mexico (UNM) grants Ph.D. degrees in Engineering with several concentrations. Four core classes (math, thermal, solids, dynamics) are required and then supplemental courses to meet needs of research. As of March 2015 the current Mechanical Engineering Ph.D. enrollment is 25-30 students, and the capacity in program is 55-60 students (4-5 students per faculty member).

New Mexico State University (NMSU) grants Ph.D. degrees in Engineering with several concentrations. No core curriculum exists, only courses that are related to a student's chosen area of study. As of March 2015 the current Mechanical Engineering Ph.D. enrollment is 3 students, and has ranged from 2-5 students over the past 5 years. The estimated capacity in program is 13 students (assuming 1 student per faculty member).

The Ph.D. Mechanical Engineering with Dissertation in Intelligent Energetic Systems (MENG-IES) program at NMIMT is built on the unique and renowned strength of NMIMT in Explosives Engineering and Mechatronics Systems Engineering. In this respect, the Ph.D. in MENG-IES program proposed by NMIMT does not duplicate the other Ph.D. programs available in the state of New Mexico. Furthermore, this new program compliments the other programs and opens a broad spectrum of collaborative educational and research initiatives between the universities and colleges located within the state. The new NMIMT Ph.D. program is a natural extension of the existing Master of Science in Mechanical Engineering program, which encompasses four areas of specialization (Explosives Engineering, Mechatronics Systems and Robotics, Fluid and Thermal Sciences, and Solid Mechanics) and has no analogous M.S. program in the state of New Mexico. Current enrollment in the Mechanical Engineering M.S. program at NMIMT is more than 50 students. This number demonstrates outstanding potential and need for the

Ph.D. program as a notable number of students in the M.S. program expressed interest in advancing their education to Ph.D. level.

Out of State

The NMIMT's Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems has no formal out of state counterparts. The proposed program is unique in that it is a synergistic integration of various branches of mechanical engineering, systems engineering thinking, and knowledge of energetics aimed at addressing growing interest in intelligent systems, explosives engineering, and related national security applications. Separately (but not collectively), some aspects relevant to the program are emphasized as separate degree programs at a few out of state universities. However, as it is shown below, focuses of the existing out of state programs are noticeably different from the NMIMT's MENG-IES Ph.D. program.

For example, very few universities in the nation offer Ph.D. degrees related to explosives engineering. The list of universities includes: University of Kentucky, Missouri University of Science and Technology, Virginia Tech, and Colorado School of Mines. Traditionally, explosives programs were established at mining departments, which defined the scope and focus of the curriculum. For example, Colorado School of Mines has several explosives related courses offered through their mining engineering program, but all of these courses are specifically focused on mining and blasting applications. In 2014, Missouri University of Science and Technology established a separate Ph.D. program in explosives engineering, but this too grew out of the mining engineering program. A similar trend is observable in most of Ph.D. programs offered by the universities listed above. The MENG-IES Ph.D. program proposed here takes a significantly different approach. This program leverages the diverse range of NMIMT faculty expertise to provide students with a unique approach to engineering energetic systems that will be applicable to more than just the mining industry.

There are very few universities in the U.S. that offer formal education related to intelligent systems. The Certificate Program in Robotics and Intelligent Systems is opened to juniors and seniors at Princeton University. As it is evident from the description of the program, it is designed for undergraduate students. The University of Pittsburgh offers a Doctor of Philosophy degree in Intelligent Systems Program with a General Intelligent Systems Track Curriculum. The program is heavily focused on computer science/engineering aspects of intelligent systems and lacks coverage of mechanical system integration. University of California, San Diego (UCSD) offers a Ph.D. in Intelligence Systems, Robotics & Control. Although this program features courses relevant to electrical, mechanical, and computational algorithms design for intelligent system, it is noticeably distinct from NMIMT's Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems, which provides substantial coverage of energetics and structures. Therefore, the Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic

Systems program proposed by NMIMT is a unique graduate program not only within the state of New Mexico, but also nationwide.

WICHE

The Western Interstate Commission for Higher Education (WICHE) seeks to leverage educational resources located in the western region to provide residents with opportunities that extend beyond the borders of their home state. We have examined existing programs in neighboring states that participate in WICHE for duplication.

There are Ph.D. programs available in Mechanical Engineering from Colorado School of Mines, Colorado State University, the University of Colorado at Boulder, the University of Utah, Utah State University, and Arizona State University. These programs are structured with emphasis in the typical areas of the discipline: solid mechanics, thermal/fluids, and dynamics and control systems. Doctoral programs with an aerospace emphasis are offered through the University of Arizona, Arizona State University, and the University of Colorado at Boulder. A program at the Ph.D. level with a systems engineering emphasis is available at Arizona State University, although this program has an emphasis on transdisciplinary approaches involving earth and environmental science. None of these programs has an emphasis (or even courses available) on energetic materials or explosives.

The Western Regional Graduate Program (WGRP) run via the Western Interstate Commission for Higher Education (WICHE) currently has no programs that grant Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. The WGRP offers two programs that feature a few aspects marginally related to intelligent energetic systems, but still lacking unique emphasis of NMIMT's program in the areas of explosives engineering and intelligent structures. These programs include Industrial and Systems Engineering and Engineering Systems. The first program primarily deals with human/machine systems and provides students with a practical knowledge in facilities planning, operations planning and control, economic and decision analysis, and project management. As can be seen from this short description, the scope of this program is quite different from the proposed NMIMT's Ph.D. in MENG-IES program. This WICHE program is an M.S., not a Ph.D. program. The second WICHE program in Engineering Systems is a Ph.D. program with some themes relevant to intelligent systems, but without opportunities to integrate knowledge of energetics and practices in explosives engineering. Educational opportunities in intelligent energetic systems are not currently available through the WICHE initiative.

As a result, proposed NMIMT's Ph.D. program does not duplicate nor substitute for any existing program in neighboring WICHE states. Furthermore, Graduate educational opportunities in Intelligent Energetic Systems are not currently available through the WGRP initiative, indicating potential regional need for the proposed program.

B.3 Inter-Institutional Collaboration and Cooperation

The proposed Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems will involve a broad spectrum of collaborative activities with other institutions in the state of New Mexico as well as with programs from other states. On one hand, there is no analogous degree program in the state and in the nation. On the other hand, it is believed that collaboration with other institutions will broaden student experiences and benefit the program. The recent development of the New Mexico graduate cross enrollment program supports the educational collaborations outlined below.

UNM collaborative activities: Collaboration with UNM is planned along two avenues: delivery of courses via distance education facilities and joint research projects. It is believed that certain courses taught at UNM will benefit the NMIMT's Ph.D. in MENG-IES program. These courses are intended to be delivered via distance education in similar fashion to the existing sharing of courses between NMIMT and departments at UNM. For example, Students from UNM have taken our Biomedical Mechatronics course (MENG 576) via distance education in prior semesters. The following courses might be the first to be offered as part of the MENG-IES program to the students of both schools via distance education program: Fundamentals of Nanotechnology, Advanced Nanotechnology, Self-repairing Materials. The Mechanical Engineering Departments of NMIMT and UNM already collaborated in several proposals to NASA and NSF. One proposal to DOE is pending. Since 2006 the faculty and students of both departments regularly visit each other's facilities, give seminars, and discuss possibilities to collaborate in research and education.

NMIMT students and faculty actively participate in seminar/conference activities organized by UNM. Especially, NMIMT contributes to local (i.e. state wide) events such as the Rio Grande Annual Symposium on Advanced Materials (RGSAM).

Dr. Hargather gave a seminar at UNM as part of the Mechanical Engineering Department seminar series March 27, 2015. Based on the discussions after the seminar, increased collaborations are expected, especially with Dr. Vorobieff and Dr. Truman. Dr. Hargather has also attended two seminars hosted by the AIAA professional society chapter based at UNM, and has interacted with UNM faculty and students at the associated social hours. Dr. Zagrai has also participated in UNM seminar series and is a member of New Mexico's AIAA chapter.

As a junior faculty member, Dr. Mousavi has recently submitted a pre-proposal to NASA EPSCOR in collaboration with UNM and is developing a graduate level course in which students will attend the lectures at NMIMT or via distance education technology and benefit from laboratory instruction in the cleanroom facilities at UNM's Manufacturing Technology Training Center (MTTC). This opportunity will not only provide a chance to share facilities and courses between the two schools, but it is also aimed to help the two schools complement and benefit from each other's facilities and specialties.

Dr. Grow has a joint appointment at UNM as an Adjunct Assistant Professor in the Department of Orthopaedics, School of Medicine. He has twice taught MENG 576, Biomedical Mechatronics with students enrolled at UNM through the Center for Biomedical Engineering. Dr. Grow also has coauthored proposals with multiple faculty from UNM and NMSU and currently has a funded project at UNM.

Dr. Bakhtiyarov has collaborated as an IPA with DoD US Air Force HQ, NASA HQ, DoE, EPA, SNL, LANL, JPL on Mars Science Lab project (2011-2014). In addition he has submitted a collaborative proposal entitled “New Mexico - Columbia Univ. and Penn State Univ. MRSECs Partnership: Synergistic Partnership for Integrated Research and Education on Multifunctional Materials and Composites” to NSF PREM Program. Duration: 5 years. Total Cost requested from NSF: \$2,765,619 and is preparing to submit a collaborative proposal with NMSU entitled “Undergraduate Spaceflight Center – NM HSI Perspective” to NASA MUREP Program. Duration: 3 years. Total Cost requested from NSF: \$701,097.

Dr. Ghosh has initiated a number of collaborations including a proposal with Dr. Ram K. Tripathi, a Senior Research Scientist at NASA Langley Research Centre and Dr. Ming Tang, Technical staff, Los Alamos National Laboratory focused on A Novel Multi Functional Composite Material for Radiation Protection for NASA Spacecraft and Astronauts. This proposal was funded for \$56,750. An Education Partnership Agreement (EPA) was signed by AFRL [Point of contact (POC) as John E. Higgins] and NMIMT [with POC as A. K. Ghosh] during 2004 and is still in operation. This EPA provides an opportunity for NMIMT students to work in a technology rich area with excellent employment prospects. With AFRL/RV, Dr. Ghosh conducted acoustic testing on fluid-filled, porous media in a four-microphone transmission loss tube. The outcome of the effort has been a patent disclosure submitted by NMIMT and a journal article.

NMSU collaborative activities:

A collaboration already exists between NMSU and NMIMT to teach courses in the undergraduate aerospace engineering program. This program was initiated and is financially supported by the State of New Mexico. NMIMT has established an undergraduate minor degree program in Aerospace Engineering within the existing NMIMT mechanical engineering B.S. program. The current NMSU/NMIMT collaborative plan is for each university to offer, via distance education, one or more undergraduate courses per year in aerospace engineering, available to undergraduate students at both universities. NMSU taught the course Aerodynamics I via distance education. This course was taken by both NMSU and NMIMT students. In several Fall semesters, NMIMT’s Orbital Mechanics course was available to NMSU students, and NMSU’s Flight Dynamics course was available to NMIMT students. NMSU’s Aerodynamics II course was also available to NMIMT students. NMIMT offers a Compressible Fluid Flow course that is available to both graduate and undergraduate students at NMSU. At the same time NMSU offers Astrodynamics. The NMSU/NMIMT collaboration at the undergraduate level is functioning well and will be expanded to include graduate courses.

NMIMT and NMSU established a strong collaboration in the research. In 2007 NMSU and NMIMT received a joint grant from NASA EPSCoR in the amount of \$1.5M for three years. Another joint proposal submitted to DOE is pending (\$5M for five years). Each year, in collaboration with NMSU, NMIMT participates in NASA EPSCoR and other NASA proposals. All of these proposals include graduate assistants and resources to conduct graduate level research.

Northern NM College collaborative activities:

Since 2008 NMIMT and NNMC established a strong collaboration in research and education. The faculty of both schools submitted several joint proposals to NSF, NASA and DOE. More collaboration is expected in the near future by providing distance education classes in the renewable energy area.

University of Texas at El Paso collaborative activities:

Since 2012, NMIMT and UTEP have established a strong collaboration in research and education. The faculty of both schools submitted joint proposals to NSF and DOE. These proposals include graduate assistants and resources to conduct graduate level research.

Missouri University of Science and Technology collaborative activities: In 2012, a MOU was established between Missouri University of Science and Technology (MST) and NMIMT in order to expand the explosives engineering education curriculum at MST as part of their Ph.D. in Explosives Engineering. The MOU allows credits to transfer between the two institutes in a few selected explosives classes. Students who have been under this MOU have been exposed in an engineering/science side of explosives application, and are greatly affected by the uniqueness of the program that NMIMT provides.

In addition to the collaborative relationships established with other universities, NMIMT has ties to New Mexico's two prominent national laboratories. These ties have helped impact our curricula and are described below.

Sandia National Laboratories (SNL) collaborative activities:

The current M.S. degree with specialization in explosives engineering was initially started through contact with several adjunct faculty members from the nearby national labs. This kind of collaboration with the national labs has been well established as a practice for over a decade now. Currently, in every single semester, the program continuously invites professionals from the national labs (Sandia National Laboratory, Los Alamos National Laboratory) or other research/consulting organizations with a wealth of experience as a guest lecturer or an adjunct professor in every area of subject. This activity has been successfully accomplished, and based on this activity along with the proposed Ph.D. program, more wide ranges of research/consulting collaboration with those organizations are expected.

Los Alamos National Laboratory (LANL) collaborative activities: Collaboration with LANL includes: delivering graduate courses to LANL staff, a teaching seminar series by LANL researchers, delivering invited lectures by LANL personnel, and establishing joint research directions, some of which would lend themselves well to long-term Ph.D.-level research. Additionally, NMIMT students participate in the Structural Dynamics School organized by the LANL Engineering Institute.

Cross-campus Collaborations

The faculty and students collaborate with the research scientists at on-campus research centers at New Mexico Tech including the Energetic Materials Research and Testing Center (EMRTC), the Petroleum Recovery Research Center (PRRC), and the Institute for Complex Additive Systems Analysis (ICASA). In addition, a faculty member has a current project in conjunction with the state Bureau of Geology, housed on the NMIMT campus. Engineering faculty participate in the research of these centers as PIs, Co-PIs, and collaborators, because of the close alignment of faculty research interests and the center foci. Graduate and undergraduate students benefit from these collaborations through campus jobs and research assistantships, while broadening their education through applications. These collaborations would be strengthened through the creation of this Ph.D. program and new opportunities for student research projects will be developed.

EMRTC is the largest of the research divisions of New Mexico Tech. EMRTC performs research and testing of energetic materials for customers including the federal government, defense contractors, and private companies that develop explosives or explosive-related systems for a range of applications. The EMRTC facilities include over 10,000 square feet of office and traditional laboratory space in addition to over 40 square miles of field laboratory testing space.

Collaboration between EMRTC and university departments is frequent and ongoing. Four professors in the Mechanical Engineering department (Grow, Hargather, Kimberley, Lim) have joint appointments with EMRTC, which allows these faculty members to perform testing in the EMRTC facilities and to easily participate as Co-PIs or subject matter experts on EMRTC funded projects. One faculty member, Dr. Hargather, has his research laboratory in an EMRTC building to facilitate direct collaboration. Dr. Hargather and Dr. Lim both have currently-funded research programs that they are PI on that directly involve research and testing at EMRTC. These funded research efforts are directly supporting graduate students toward Masters of Science degrees and would support Ph.D. students in the future. In the period of 2008-2015, 24 students graduated with M.S. degrees in Mechanical Engineering that were directly involved with EMRTC in some capacity.

Each year EMRTC directly supports a noticeable number of science and engineering students through student jobs, research assistantships, and scholarships. In some departments, an average of two graduate students are supported on research assistantships or scholarships through EMRTC each year allowing them to complete their thesis and

coursework. These students participate in EMRTC funded research and are mentored by joint-appointed faculty and EMRTC senior engineers. In the Mechanical Engineering alone, EMRTC hires approximately 10 undergraduate students each year for jobs ranging from field work to student engineers. Many of these undergraduates continue to graduate school; especially remaining at New Mexico Tech because of the research they were exposed to at EMRTC.

PRRC is a research center dedicated to improved oil and gas recovery research for independent hydrocarbon producers throughout the state of New Mexico. PRRC performs research and development that is funded by organizations including the Department of Energy and by private corporations. Research is performed on campus and at sites throughout the southwest.

Collaboration between the university departments and PRRC includes collaborative research proposals and funded projects supporting students pursuing graduate degrees. These research projects include research connected to the fluid-thermal sciences and energetic materials.

ICASA performs research in computer science, mathematics, engineering, and management for government and private sector customers, and is co-located with EMRTC on the New Mexico Tech campus. A robotics faculty, Dr. Grow, has collaborated with ICASA for development of robot control algorithms to define the operation space for a particular customer robot. This research included support for a graduate student who completed his graduate degree in 2014, based on the work performed at ICASA.

In addition to collaborations with the on-campus research centers, the Department of Mechanical Engineering has established collaborative activities with other academic departments on campus. In recent years Mechanical Engineering faculty have co-authored funding proposals with faculty members of the following departments: Mathematics, Physics, Earth and Environmental Science, Chemistry, Biology, Civil Engineering, Computer Science, Electrical Engineering, Materials Engineering, and Engineering. For example, Dr. Hargather has submitted several proposals related to the development of novel energetic materials with Dr. Henneke of Materials Engineering. Dr. Kimberley has been a co-investigator on an NSF proposal to study blast induced rock fragmentation with faculty members of Mineral Engineering. Dr. Grow has submitted proposals with Electrical Engineering faculty to NFS National Robotics Initiative dealing with cooperative robotic–human interfaces. Dr. Ghosh has collaborated with Faculty from materials Engineering and Chemistry to submit a proposal to NSF to investigate the use of carbon nanotubes as flow sensors. The Department of Mechanical Engineering has also engaged in offering graduate courses listed or cross-listed in other departments. Specific examples from recent semesters include: Materials Engineering (MATE 445, MATE 530) and Mineral Engineering (ME 520, ME 549).

C Clientele and Projected Enrollment

C.1 Clientele

(a) The students to be served by the proposed Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems program are primarily:

- i. Recent bachelor or master degree graduates, who obtained their degrees in science, engineering, technology, or another closely related discipline and who are interested in advancing their education, training, and expertise to compete for high level employment positions in industry, academia, and governmental entities.
- ii. Qualified working professionals who have encountered a need to strengthen their professional capabilities.
- iii. Qualified staff members of national laboratories and other governmental entities who wish to continue their professional education.

It is anticipated that the majority of students in the program will be accommodated on a full-time basis. However, due to specifics of national laboratories and other governmental/private entities, their staff members will be likely involved as part-time students.

(b) The following guidelines are proposed for admission of students into the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems:

- i. Admission to NMIMT's Ph.D. in MENG-IES program will be consistent with general admission requirements set by the NMIMT graduate school. These requirements, among others, include GRE (domestic and international students) and TOEFL or IELTS (most of international students) tests.
- ii. Candidates for admission into the Ph.D. MENG-IES program must possess a bachelor or master degree in science, engineering, technology, or other closely related discipline from an accredited institution of higher learning.
- iii. Candidates for admission into the program must indicate completeness of the pre-requisite courses and/or proof of competency in basic science and engineering subjects.
- iv. A minimal grade point average (GPA) of 3.3 on a 4.0 scale or other proof of satisfactory academic standing if the GPA is not available is recommended for candidates for admission into the Ph.D. in MENG-IES program. In addition, three letters of recommendation for admission into the program are required.

- v. Depending on the candidate's background, additional course work may be recommended to ensure meeting the pre-requisite courses and competency requirements. While completing pre-requisite courses and competency requirements for admission into the Ph.D. in MENG-IES program, a student may be allowed to enroll with provisional status.

(c) The New Mexico Institute of Mining and Technology is qualified as a *Hispanic-Serving Institution* by the U.S. Department of Education (see the attached letter in Appendix VII).

For Fall 2014 semester, New Mexico Institute of Mining and Technology Male-to-Female Ratio: 68 % male 32 % female.

The following NMIMT services are available that are aimed at increasing the higher educational opportunities for the underrepresented groups:

- Office for Student Learning (OSL) – The office facilitates the development of quality advising relationships between faculty and students as well as providing a wide spectrum of academic support services to help students explore their life goals, interests, abilities and values.
- Academic Referral Program – An early intervention program designed to identify and help students when they show signs of academic difficulty. The teaching faculty is asked to refer students to the OSL or Graduate Dean for assistance during the third week of the semester.
- Academic Counseling – Individual and group counseling is offered to help students identify their learning style and develop academic success skills such as time and stress management, study skills, and adaptive choice-making.
- Counseling and Disability Services, which mission is to support the emotional, intellectual and social development of students at NMIMT. This service helps individuals resolve existing problems, prevent potential problems, and develop new skills that will enrich their lives. NMIMT provides accessible programs, services, and reasonable accommodations for any student with a documented, qualifying disability as defined by Section 504 of the Rehabilitation Act of 1973, as amended, and by the Americans with Disabilities Act of 1990.
- Advising Resources for Faculty – A seminar for new faculty members on utilizing the theory and techniques of developmental advising, mentoring, as well as orientation to academic policies, services and resources on campus and in the community.

- Instructional Training – Teaching training is provided to all new faculty and teaching assistants. This training is provided by the Center for Graduate Studies and addresses all aspects of teaching practice.
- STEM Communication Fellows – Partial TA-ships intended to improve communication within academic departments and to assist in written and oral communication tutoring at the graduate level through the Writing and Oral Presentation Center.
- Writing and Oral Presentation Center – Provides writing and presentation assistance to students of all levels and from all disciplines. Multiple resources are available for students to consult or borrow. Technology in this center includes recording of presentations that students can view via web link.
- Student Research Symposium a (SRS) is a campus-wide co-curricular event open to all New Mexico Tech students and organized by faculty, students, administrators, and staff. The mission of the Student Research Symposium is to provide a forum for students to voluntarily share knowledge with their peers, faculty, community, guests, and reviewers through oral or poster presentations and extended abstracts of their research/design projects. Students are encouraged to develop professional oral presentation, writing, and document design skills to communicate their research/design to a multidisciplinary audience.
- Research @ Tech Day – New Mexico Tech invites prospective students and their families to explore cutting-edge research on campus.
- State Science & Engineering Fair – The Science and Engineering Fair program encourages students to explore their environment in a systematic, logical manner. Participation in the science fair stimulates students’ interest in science and technology while simultaneously promoting the development of the life skills of communication, decision making, evaluation of alternative solutions, and critical thinking.
- Supercomputing Challenge, Project G.U.T.S. – Summer Teacher Institute on the NMIMT campus training high school and middle school teachers to learn programming and then instruct and mentor their own students involved in these New Mexico events. NMIMT also hosts the kickoff event in October with approximately 400 students and teachers coming to campus to attend.

C.2 Projected Enrollment

Projected enrollments for the first five years of the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems are listed in Table 1 below. The number of enrolled students assumes that we will have two new full time students per year, and one new part time student per year. Of the full time students, it is expected that

one student will graduate in four years (entering program with M.S.) and the other will graduate in five years (entering with a B.S.). After this initial ramp-up, a steady state of nine full-time students will be achieved and we expect two full-time students to graduate each subsequent year.

Table 1: Projected student enrollment for the NMIMT's Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems

	Year 1	Year 2	Year 3	Year 4	Year 5
	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
New Students, Full-time	2	2	2	2	2
New Students, Part-time	1	1	1	1	1
Returning students Full-time	0	2	4	6	7
Returning Students Part-time	0	1	2	3	4
Total Full-time Students	2	4	6	8	9
Total Part-time Students	1	2	3	4	5
Program Graduates	0	0	0	1	2
Total Credit Hours Generated	75	150	225	300	345

D Institutional Readiness for the Program

In recent years, several NMIMT Mechanical Engineering departments have experienced an unprecedented growth. The growth is seen in practically all areas: number of enrolled students, number of newly hired faculty, number of research laboratories, amount of allocated resources, etc. For example, according to recent institutional research data shown in Table 2 & Table 3, Mechanical Engineering leads a list of NMIMT departments with the largest undergraduate student enrollment (22.7%) and the second largest graduate student enrollment (20.7%). The total numbers of students served by the department as of Fall 2015 is approximately 350 undergraduate (B.S.) students and 50 graduate (M.S.) students. Figure 1 below demonstrates the number of NMIMT Mechanical Engineering undergraduate degrees awarded for the past decade. A stable increasing pattern is noticeable. Undergraduate students provide clientele to the Mechanical Engineering graduate (M.S.) program and may consider enrolling in the MENG-IES Ph.D. program if available.

Table 2. Bachelor's degree program enrollment, sorted by descending enrollment percentages

Rank	Program Code	Program Name	Total Enrollment	Percentage of Enrollment
1	MENG	Mechanical Engineering	338	22.7%
2	PETR	Petroleum Engineering	192	12.9%
3	CSE	Computer Sci. & Engr.	153	10.3%
4	CHE	Chemical Engineering	120	8.1%
5	EE	Electrical Engineering	117	6.6%
6	BIOL	Biology	99	5.6%
7	PHYS	Physics	84	4.4%
8	CE	Civil Engineering	65	4.3%
9	MATE	Materials Engineering	48	3.2%
10	CHEM	Chemistry	37	2.5%
10	MATH	Mathematics	37	2.5%
10	ERSC	Earth Science	37	2.5%
13	ENVE	Environmental Engineering	30	2.0%
14	ME	Mineral Engineering	26	1.7%
15	TC	Technical Communications	22	1.5%
16	0000	Undecided	19	1.3%
17	PSY	Psychology	16	1.1%
18	IT	Information Technology	15	1.0%
19	MGMT/MGTT	Management	12	0.8%
20	ENVS	Environmental Science	10	0.7%
21	BS	Basic Science	5	0.3%
22	EUND	Engineering Undecided	5	0.3%
23	GS	General Studies	2	0.1%
		TOTAL	305	100.0%

Table 3. Master's degree program enrollment, sorted by descending enrollment percentages

Degree Awarded	Program Code	Program Name	Men	Women	Total Enrollment	Percentage of Enrollment
MST	ST	Science Teaching	19	46	65	21.3%
MS	MENG	Mechanical Engineering	51	12	63	20.7%
MS	PETR	Petroleum Engineering	17	7	24	7.9%
MS	GEOL	Geology	10	11	21	6.9%
MEM	MEM	Engineering Mgmt.	13	6	19	6.2%
MS	HYD	Hydrology	12	6	18	5.9%
MS	ME	Mineral Engineering	14	2	16	5.2%
MS	MATH	Mathematics	10	3	13	4.3%
MS	CSE	Computer Sci. & Engr.	6	5	11	3.6%
MS	EE	Electrical Engineering	10	1	11	3.6%
MS	CHEM	Chemistry	5	3	8	2.6%
MS	MATE	Materials Engineering	6	2	8	2.6%
MS	ENVE	Environ. Engineering	4	3	7	2.3%
MS	BIOL	Biology	2	4	6	2.0%
MS	GEOP	Geophysics	4	2	6	2.0%
MS	GEOC	Geochemistry	2	3	5	1.6%
MS	PHYS	Physics	2	2	4	1.3%
TOTAL			187	118	305	100.0%

NOTE: One graduate student seeking a Post-Baccalaureate Certificate is not included on this table

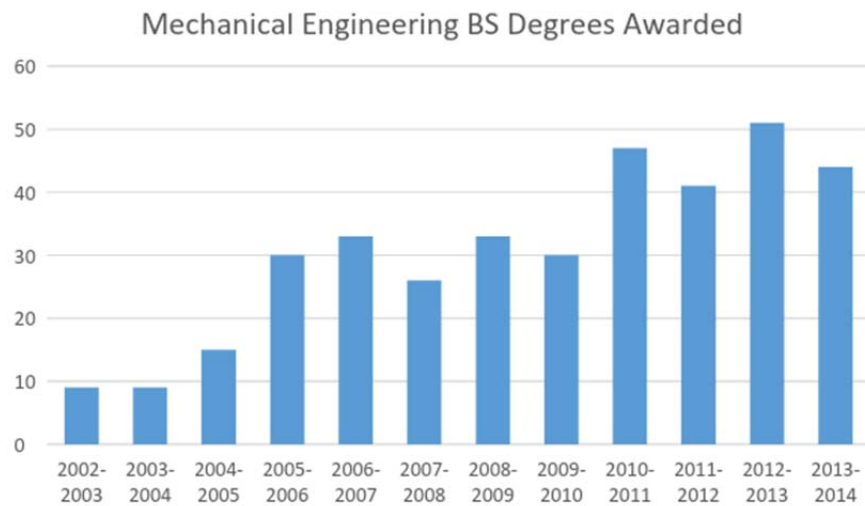


Figure 1: Annual accounting of Mechanical Engineering B.S. degrees awarded.

D.1 Teaching faculty

The Department of Mechanical Engineering includes 13 full-time, tenured or tenure-track faculty members. These faculty members, with their areas of specialization, are listed in Appendix II. Each of these faculty members teaches an average of two, three-credit courses per semester. In addition, approximately 8 adjunct faculty appointments are anticipated per year, with each adjunct teaching an average of one, three-credit course per year. The adjunct faculty that have taught graduate courses during the past 4 semesters (Fall 2015- Spring 2014) are also listed in Appendix II. The current staffing of the department with full-time and adjunct faculty is sufficient to initiate this proposed Ph.D. program and teach all required graduate and undergraduate courses in the department. We also expect the program to be enriched by faculty course offerings from other departments, but the program is not dependent upon those offerings.

The development of this Ph.D. program will create the possibility of using graduate student assistants that can assist with teaching undergraduate mechanical engineering courses. It is anticipated that some graduate teaching assistants will be used to teach laboratory courses, but no full classes will be taught with graduate assistants. The department prides itself in the excellence of teaching provided by the faculty and is not looking to change the general teaching structure used at the undergraduate level.

Overall, we expect a successful addition of the Ph.D. program to our existing graduate degree programs through a more efficient course catalog and better rotation of class offerings on a two-year cycle. With this careful planning, the current teaching resources will be sufficient to support the new Ph.D. program.

D.2 Library and other academic resources

NMIMT Skeen Library has a rich offering of science and engineering resources to support the proposed Ph.D. program in Intelligent Energetic Systems. The library maintains subscriptions to electronic journals and research databases that are available to NMIMT faculty, staff and students. These resources are also available off-campus by using the library's EZProxy system or the NMIMT Computer Center's VPN server. The library currently subscribes to many prominent electronic research collections including: IEEE/IET Electronic Library, VDE Verlag Conference Proceedings, ACM Digital Library, ASME, Elsevier's ScienceDirect, Springer, IOP, AIP and ACS. Related research databases include Compendex, Web of Science, Computer Database, Computers & Applied Sciences Complete and CSA Materials Research Database. The library's book collection is substantial with 93,000 printed books and over 350,000 eBooks available for immediate download 24/7. Some articles from non-subscribed journals and books not available in the NMIMT library can be obtained via Interlibrary Loan. NMIMT Skeen Library and other academic resources including computer services and distant education support are sufficient to initiate the Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems.

D.3 Physical facilities

Mechanical Engineering occupies a large portion of Weir Hall. Recent expansion of the department resulted in the presence of Mechanical Engineering facilities in most buildings on the university campus. The faculty-led Space Utilization Committee is considering consolidating department facilities in a few buildings.

D.4 Equipment and technological resources

An important aspect of the Ph.D. Program is availability of resources to conduct research. Mechanical Engineering faculty supervise research laboratories within their area of expertise. A list of laboratories is provided below.

Laboratory for Intelligent Systems and Structures (LISS) conducts research in sensors, intelligent systems, dynamics, and structural health monitoring areas. The laboratory occupies approximately 318 sq. ft. The laboratory is well equipped with a complete line of analog and digital equipment including a number of analog function and pulse generators, oscilloscopes, signal amplifiers, and a programmable power supply. Digital instruments are realized via a broad spectrum of National Instruments (NI) DAQ and signal generation cards, NI signal conditioning units, and a 4 channel Tektronix 200 MHz digital oscilloscope. The equipment covers a broad frequency range allowing for both high frequency ultrasonic testing and low frequency structural dynamic analysis. A conventional HP4142A impedance analyzer is available in the lab for broadband impedance measurements. In addition, to expand research capabilities in ultrasonics, the state-of-the-art RAM-5000 acoustic testing system has been acquired from Ritec Inc. The system is capable of delivering dual-channel high power (up to 7 kW) high frequency (up to 20 MHz) RF bursts for driving EMAT or piezoelectric transducers. RAM-5000 incorporates a broadband receiver and allows for complete signal synchronization for up to 80 MHz. The laboratory research is supported with a wide range of sensors including 2 and 3 axis accelerometers, strain gauges, Hall effect sensors, infrared sensors, LVDTs, and light and temperature sensors. Noncontact measurement of vibration velocity can be achieved using the Polytec's single-point laser Doppler vibrometer (LDV). Piezoelectric active sensors of various shapes and sizes are being fabricated in the laboratory from the piezoceramic sheets supplied by Piezosystems Inc. Several sets of commercially produced piezoelements are available that cover a wide range of dimensions and spectral characteristics.

The Laser Flow Diagnostics and Combustion Engines/Fuels Research Laboratories are used for multi-research and teaching purposes. The Laser Flow Diagnostics Lab is equipped with state of the art Particle Image Velocimetry (PIV) equipment, combustion setups and a low speed wind tunnel and water tunnel. PIV equipment consists of Nd:YAG laser with dual laser cavities, laser light sheet optics, CCD cameras and necessary software. The wind tunnel is equipped with a bench, control panel, wind tunnel including an inlet cone, clear experiment section, outlet cone and screen; manual traverse unit, linear track

with carrier; and main AC circuit breaker. The bench includes a shelf for storage and is mounted on eight casters. The water tunnel is a university desktop water tunnel model 0710 from Rolling Hills Research Corporation. Engine lab capabilities include Engine performance analysis measurements of exhaust gas emissions, in-cylinder pressure-crank angle measurements, testing of biofuels, alcohols, diesel and blended fuels and determination of flash point, heating value, kinematic viscosity, and density of fuels.

The Laboratory for Smart Materials and Structures (LaSMaS) was established with the goal of realizing sustainable structural systems. LaSMaS aims to conduct research on: 1) autonomous composites for self-sustaining structural systems, 2) multifunctional façade for sustainable infrastructures, and 3) resilient structural materials and composites. These goals can be achieved *via* multidisciplinary research spanning materials science, nanotechnology, optoelectronics, and structural engineering. By conducting multidisciplinary research, LaSMaS can build up smart composites and sustainable structural systems by using high-performance and multifunctional materials *via* the “bottom-up” methodology. Research capability of LaSMaS is three-fold: 1) synthesis and functionalization of advanced materials (*i.e.*, functional polymers, carbon nanotubes, and nanoparticles, among many others), 2) scale-up fabrication of multifunctional composites, and 3) multi-physics characterization and validation of the fabricated composites. LaSMaS is capable of materials processing, composites fabrication, and materials characterizations with equipment as follows: ultrasonic-powered materials processor (*i.e.*, ultrasonic bath and high-powered tip sonicator), fume hood, UV-ozone cleaner, spin-coating thin film fabricator, and ultraviolet-visible (UV-Vis) spectrophotometer.

The Shock and Gas Dynamics Laboratory (SGDL) specializes in optical diagnostics of compressible flows. It houses a range of experimental equipment for evaluating and measuring fluid flows across a wide range of flow velocities. The primary measurement techniques employed are optical flow measurement techniques, including schlieren, shadowgraphy, high-speed imaging, and particle image velocimetry. The lab also has computational capabilities including ANSYS/FLUENT and OpenFOAM for performing computational fluid dynamics (CFD) simulations of various flows. The schlieren and shadowgraph techniques are used to visualize flows with refractive disturbances present due to temperature or density gradients in a flow. These techniques are used extensively for high-speed visualizations, including shock waves and compressible jets. For low-speed flows these techniques are useful for identifying thermal or chemical plumes from various sources. The lab has a wide range of schlieren systems ranging in field of view from 0.05-1m in diameter. Several shadowgraph systems are also available with fields of view up to 2x2m square, all of which are portable and can be used in the laboratory or field environment. The laboratory has two high-speed continuous digital video cameras, one Photron SA-X2 and one Phantom v711 (manufactured by Vision Research). These cameras are capable of recording at up to 1 million frames per second and can be integrated with the schlieren and shadowgraph systems as needed and are also used to perform background-oriented schlieren visualizations in the laboratory and field settings.

The MEMS Laboratory is currently being developed by Dr. Mousavi. One of the main pieces of equipment will be his patented Interferometer Microscope which is capable of measuring out of plane motion/deformation of samples as big as 1mmx1mm by a resolution of less than 1Angstrom. This microscope can be used to measure vibrations of MEMS/NEMS up to 2MHz with the current configuration but has the potential of even higher frequencies. The in-plane resolution is limited by light diffraction limit. Other equipment will include different fabrication and characterization tools which will complement the currently available equipment of NMIMT.

The Water Desalination Test Facility. Office of Naval Research (ONR) and Department of Energy (NETL) funding resulted in the development of a market ready water desalination system using Forward Osmosis (FO). The pilot scale, 1000 gallons per day system, desalination system is placed in a mobile and self-contained 33 ft highway-certified commercial trailer. The trailer was taken to fields located at Jal County in South East NM and at Abilene, Texas to demonstrate the technology to possible markets. NMT has filed for a US patent for the “Mechanically Enhanced Circular Raceway” module that was heart of the desalination technology.

The Robotic Interfaces Laboratory (RIL) aims to develop robotic tools that aid humans in performing complex tasks. The RIL is equipped for data acquisition relative to these goals, with instruments including multiple National Instruments data acquisition systems, various force, pressure, acceleration, and acoustic sensors. Large area and multi-body kinematics can be captured using an 8-camera Optitrack systems (Flex 13; 120 fps; 1.3 MP resolution; 4.2 ms latency). The RIL also houses multiple haptic devices (Phantom Omni (3), Phantom Premium, and Entact W5D), which can be programmed to provide between 3-5 degrees of force feedback, with up to 38 N force (peak) or 6 N (continuous) and servo loop rates of up to 2000 Hz. The RIL also has a full complement standard electronic bench equipment and hand tools for construction and testing of custom robotic devices.

The Shock Physics Lab is an explosives test preparation lab with numerical simulation capability focusing on the explosives and shock physics related research and development. Equipment includes VISAR (Velocity Interferometer System for Any Reflector) shock analysis equipment, VISAR data reduction software, a PXI system (data acquisition) with 2Gs/s capability, a high-speed camera with a max recording rate of 16000fps, Ansys Autodyn (simulation software) hydrocode simulation, two 12 core clusters: hydrocode simulation computational systems, and one 18 core cluster: hydrocode simulation computational system. Physical space is approx. 800 sq. ft.

The Lab for Oil Recovery Studies houses pumps and pressure monitoring equipment as well as analytical tools for oil recovery work. Specific equipment includes Ruska positive displacement pump, 10,000 psi, ISCO 500D & LC-5000 pumps, 3700 psi (20), ISCO 1000D pumps, 1250 psi (2), ISCO LC-2600 pumps, 7500 psi, ISCO model 314, 2850 psi, low-pressure utility pumps (2), Welch vacuum pumps (4). Pressure monitoring equipment includes Honeywell ST3000 pressure transducers (44), Honeywell Smart Field

communicators (4), Validyne transducers (10), MC-1-10 carriers (2), MC-1-20 carriers (2), MC-1-3 carrier, assorted pressure gauges, Grove back-pressure regulators (6). Analytical equipment includes Waters 486 tunable absorbance detectors (5), Waters 484 tunable absorbance detectors (2), Shimadzu TOC-5050A total carbon analyzer, spinning drop interfacial tensiometer five-cell, fixed speed, controlled temperature, Orion 520A pH/ion meter (3), Orion SA520 pH/ion meter (2), flow-through pH holders (5), Fisher accumet pH/ion meter, Bausch & Lomb abbe refractometer pH meters (4), Hach Ratio turbidimeter, Klett-Summerson turbidimeter, Standard model zeta-meter, TBI TBS40 high pressure pH probe, Milton Roy Spectronic 20 D spectrophotometer. In addition are multiple viscometers and rheometers, data acquisition and processing equipment, photographs, video and optical equipment.

The Dynamic Deformation and Failure Laboratory (DDFL) at NMIMT focuses on characterizing the mechanical response of materials/structures subjected to extreme dynamics loads. The laboratory houses several dynamic testing set-ups including compression and tension Kolsky (Split-Hopkinson) bars of various diameters. The Kolsky bars can be used to test specimens on the order of 1-25 mm at strain rates in the range of 10^2 - 10^4 s⁻¹. Diagnostics include a Tektronix 2GHz digital oscilloscope and a HBM Gen-2i 12-bit high speed data acquisition system capable of capturing 4 channels of data at up to 100 megasamples per second. A Vision Research Phantom v711 high speed digital video camera is also available to capture images of deformation and failure processes at frame rates up to 1.4 million frames per second and exposure times as short as 200 ns. Sample preparation facilities are also available in the DDFL including a low speed diamond saw, lapping and polishing machines.

The Computational Fluid Dynamics Laboratory focuses on the numerical simulation of complex fluid flow fields that are relevant to national security and green energy initiatives. The lab features a high performance computing cluster with 20 computing nodes (4-core per node), and a 16-core workstation for data visualization. Relevant software packages include OpenFOAM, Salome, and Paraview.

D.5 Other operating resources

The support staff currently available at the Department of Mechanical Engineering is adequate to start the Ph.D. program and run it for at least five years. The need for additional staff support is anticipated as the program develops into later stages after 5-10 years. We have identified the following long-term needs for the program:

- i. Additional office assistant
- ii. Lab assistant / technician.
- iii. Machine shop supervisor

E Projected Cost of the Program

New Mexico Institute of Mining and Technology places a special emphasis on establishing a strong research component of academic programs. Investment in high-quality research and graduate education allowed the Mechanical Engineering department to secure the largest enrollment of undergraduate students and second largest enrollment of graduate students in the whole university. This successful investment implies that the majority of costs associated with a new Ph.D. program have already been covered by the institution and no substantial additional investment is anticipated.

E.1 New Costs for Program Start-Up

NMIMT continues investments in the Mechanical Engineering MS graduate program with several specializations including Explosives Engineering and Mechatronics Systems and Robotics. A new Ph.D. program is built upon a solid foundation of the M.S. program and will require little additional support. It is envisioned that some students currently enrolled (or thinking about enrolling) in the M.S. program will desire to pursue a Ph.D. degree and the total number of Mechanical Engineering graduate students, which is around 50 now, will not change substantially. This means that faculty load and allocation of other necessary resources could be comparable with current investments.

Resources already in place:

- (a) Library resources
- (b) Facilities, equipment and technological resources
- (c) Faculty instructional resources

Resources necessary beyond the current level of support are indicated below.

- (a) Five new graduate teaching assistantships are needed to support the program. The current cost of a full (half time) teaching assistantship is approximately \$21,000 per year. These new TA positions are proposed to be phased in as the Ph.D. program develops. Due to the recent addition of new faculty and undergraduate enrollment, some departments are moving rapidly towards balancing enrollment by offering senior courses every semester. Such a balance is achieved by increased employment of graduate teaching assistants in primarily laboratory sections of these courses. The Department has already increased a number of teaching assistants and plans to continue increasing them as the Ph.D. program grows.

E.2 State Support

The state of New Mexico has recently changed the approach to formula funding. State support projected in accordance with a new formula funding is presented below.

Table 4: Expected amount formula funding per each year of the NMIMT’s Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems program

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Full-Time Students						
Students enrolled	2	4	6	8	9	9
Graduate credits/student/year	30	30	30	30	30	30
Undergraduate credits/student/year	0	0	0	0	0	0
Credit funding	\$85,020	\$170,040	\$255,060	\$340,080	\$382,590	\$382,590
Part-Time Students						
Students enrolled	1	2	3	4	5	6
Graduate credits/student/year	15	15	15	15	15	15
Undergraduate credits/student/year	0	0	0	0	0	0
Credit funding	\$21,255	\$42,510	\$63,765	\$85,020	\$106,275	\$127,530
Graduates	0	0	0	0	2	2
Degree funding	0	0	0	0	\$6840	\$6840
STEM funding	0	0	0	0	\$10260	\$10260
Total formula funding	\$106,275	\$212,550	\$318,825	\$425,100	\$505,965	\$527,220

E.3 Other Support

It is anticipated that additional support for the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems will come from department faculty research grants and contracts. The support will come in the form of research assistantships (RA) for qualified mechanical engineering graduate students enrolled in the Ph.D. program. The Mechanical Engineering Department shows a healthy research funding landscape. Figure 2 demonstrates that the average annual research at the department exceeds \$1M, and the average annual funding level per faculty is over \$100k. Considering that typical annual graduate student research assistantship is approximately a quarter of faculty’s annual funding level, ample opportunities for Ph.D. student research assistantships exist. In addition, funding from research grants received by mechanical engineering faculty is spent on acquiring research equipment, materials, and graduate student travel. Additional graduate student travel support exists through a travel scholarships distributed by the Graduate Student Association in conjunction with the NMIMT Graduate Office.

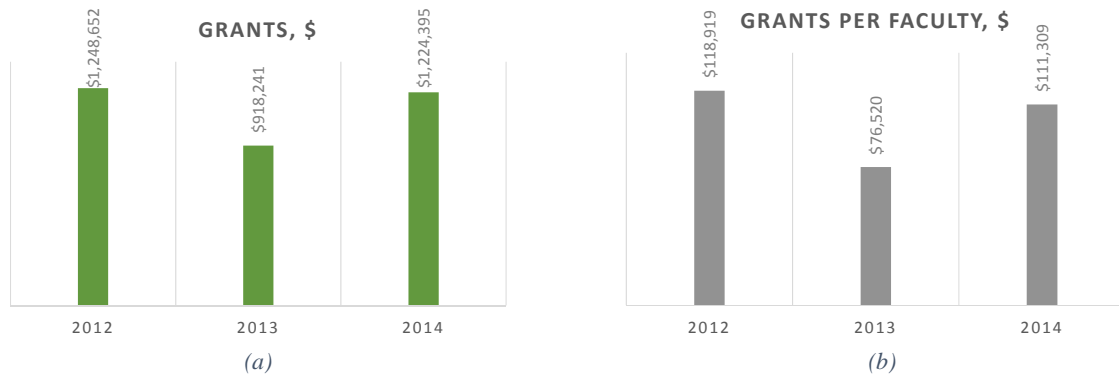


Figure 2: Research grants awarded to the Department of Mechanical Engineering: (a) Total dollar amount per year, (b) Dollar amount per full-time department faculty per year.

Over the past several years, mechanical engineering faculty received a considerable number of large (several hundred thousand dollar) grants from NASA, FAA, DHS, ONR, AFOSR and other agencies. Very recent examples of such grants includes – a Defense Threat Reduction Agency Young Investigator award received by Dr. M. Hargather (explosives) and 5 year renewal of FAA funded Center of Excellence for Commercial Space Transportation, where NMIMT participates with tasks ranging from intelligent systems engineering to explosives testing. It is anticipated that financial support received through research funding complemented by teaching assistantships provided by the university, will be sufficient for initiation and operation of the proposed Ph.D. program.

F Quality of the Program

The Ph.D. curriculum in Mechanical Engineering with Dissertation in Intelligent Energetic Systems will be built on two existing M.S. level specializations in Explosives Engineering and Mechatronics Systems & Robotics, plus a few relevant graduate courses from other departments. In addition, a number of fundamental graduate courses will be included in the program core to ensure a breadth of graduate education and a solid base in engineering fundamentals. This wide range of course offerings also provides the opportunity for Ph.D. candidates to craft unique interdisciplinary plans of study which serve as the foundation for cutting edge research topics in mechanical engineering related to intelligent energetic systems.

To ensure the Intelligent Energetic Systems focus of the program, but allow for breadth of graduate education and specifics of an individual research topic, the program consists of 27 credit hours of core courses and 9 credit hours of elective courses. The core of the program includes three segments: Energetics, Intelligent Systems, and Fundamental Science and Engineering. Nine credit hours (i.e. three courses) must be selected from each core segment. An additional nine credit hours of elective courses approved by the candidate's advisory committee will be counted towards 36 hours of course work beyond B.S. degree.

General Degree Requirements (note the full curriculum is described in Section A.4)

- 36 credit hours of formal coursework beyond B.S.
- 24 credit hours of dissertation research credit
- 9 credit hours of Directed Study
- 3 credit hours of Graduate Seminar
- Written and/or oral qualifying examination as determined by Graduate Study Committee
- Written dissertation proposal and oral preliminary (Candidacy) examination focused on the presentation of the proposed dissertation topic.
- Publication of one article in a peer-reviewed scientific or engineering journal
- Final defense of the Ph.D. dissertation

These requirements are similar to other programs in NM and the U.S. Table 5 provides a comparison of our proposed curriculum with other programs in the U.S.

Table 5: NMIMT Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems proposed curriculum compared with Mechanical Engineering programs of other institutions.

Institution	Credit Hours Past B.S.	Coursework Credits	Dissertation Credits	Qualifying Exam	Candidacy Exam	Dissertation Defense
New Mexico Inst. of Mining and Tech.	72	36	24	Oral/Written	Oral/Written	Oral
New Mexico State U.	60	36	24	Written	Oral/Written	Oral
U. of New Mexico	72	54	18	Written	Oral	Oral
Michigan Tech.	60	NR	NR	Written	Oral	Oral
Colorado School of Mines	72	42	30	Written	Oral	Oral
U. Texas at San Antonio	90	54	36	Oral/Written	Oral	Oral

The hiring of five (5) new faculty members over the past three years has brought the program roster to a total of thirteen (13) full-time faculty. All of these recent hires have been tenure-track appointments, with the goal of raising the level of externally funded research. Our recent growth has brought new areas of teaching and research expertise to the department, and provided for an increase in the number and diversity of courses offered at the graduate level. Our full-time faculty now represents a critical mass required for a healthy doctoral program. Our strong ties to local research institutions (SNL, LANL, AFRL) has also allowed for the development of a strong adjunct faculty pool. These adjunct faculty enrich both our core and elective course offerings by providing courses in areas relevant to their research expertise.

The majority of engineering Ph.D. programs across the nation require a minimum grade point average in the range of 3.0-3.3 out of 4.0. Most programs require a student to have taken the general Graduate Record Exam (GRE), but do not enforce specific requirements. Other admission requirements include an average of three letters of recommendation. Our university and program requirements are in line with the majority of programs in the U.S.

The Mechanical Engineering department have a number of technology resources currently available to the graduate student population. These resources will be made available to graduate students pursuing a doctoral degree as well.

The department is home to several state of the art research and instructional laboratory facilities. These experimental and computational facilities provide the core resources required for the students dissertation research. In addition to research space, the department provides students with office space and individual computer workstations with high-speed access to the campus network and various software analysis packages. Access to the department high-performance computing cluster is also available. Also available is a recently acquired graduate student collaborative meeting space.

In addition, technology resources are available at the university level. Our faculty members have strong ties to campus affiliated research centers such as the Energetic Materials Research and Testing Center (EMRTC), Institute for Complex Additive Systems Analysis (ICASA), Petroleum Recovery Research Center (PRRC). These centers can provide graduate students access to advanced computational and experimental facilities.

Graduate students have access to NMIMT's library resources described in section D.2. Virtually all graduate level Mechanical Engineering courses are taught in classrooms utilizing NMIMT's distance education capabilities. This provides off-campus students access to lectures in real time, as well as an option for on-campus students to review recorded lectures.

The depth and breadth of coursework combined with the focused dissertation research will prepare graduates for employment in areas such as high-level R&D and academia. During their studies, students will be exposed to state of the art experimental and computational resources, providing exposure to technology that may be encountered in their future workplace. The completion of dissertation research will ensure that the graduate is capable of extending core knowledge into new areas of investigation that will serve to benefit humankind. The passing of several oral examinations, and the preparation of the dissertation will ensure that the graduate is capable of communicating in both verbal and written forms. These communication skills are critical for success in any work environment.

The department offers financial support through teaching assistantships and externally funded research assistantships. The Graduate College provides information on other sources of financial support. Several non-financial support programs exist on campus to

assist students in the pursuit of their degree. The Graduate Student Association (GSA) provides a mechanism for identifying and resolving issues that pertain to graduate students (e.g. changes to tuition, or policies that directly affect graduate students). The GSA also provides opportunities for career development by hosting on-campus seminars and providing travel support for students to attend technical conferences. The NMIMT Writing and Oral Presentation Center is another resource that is available to graduate students; providing assistance with the preparation of manuscripts, theses/dissertations, and oral presentations.

Scholarly research is the central focus of the Ph.D. program, and the culmination of years of research under the supervision of the department faculty is the preparation of a dissertation. This dissertation must be successfully defended in a presentation, which is open to the faculty and the general public. Such final examination ensures that the student is capable of producing quality research and can communicate effectively his/her results to a broad audience. The additional requirement of at least one publication in a peer-reviewed technical journal ensures that the graduate's research is of value to the greater scientific community.

Higher Learning Commission (HLC) accreditation will be sought for the Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems (MENG-IES). We plan to apply for HLC accreditation visit as soon as, potentially, state approval of MENG-IES program is granted. ABET, the accrediting agency for engineering programs, will accredit either the undergraduate or graduate program, not both. All of NMIMT's engineering departments participate in the ABET accreditation process for their undergraduate programs, therefore only HLC accreditation of MENG-IES program will be sought. The MENG-IES Ph.D. program will follow university guidelines for graduate education at NMIMT.

G Assessment of Operations and Impact

Procedures already implemented for assessment of existing M.S. program in Mechanical Engineering will be used to evaluate operation and impact of the Ph.D. program. The program will be assessed annually to ensure the following learning outcomes are demonstrated by mechanical engineering graduate students:

- a) an ability to apply advanced knowledge of mathematics, science, and engineering
- b) an ability to identify, formulate, and solve engineering problems
- c) an ability to design, document, and conduct experiments, as well as to analyze and interpret data
- d) an ability to analyze requirements, propose design and evaluate practical realization of an engineering system.
- e) an ability to communicate effectively

- f) an understanding of professional and ethical responsibility
- g) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- h) a recognition of the need for, and an ability to engage in life-long learning
- i) a knowledge of contemporary (within the profession) issues
- j) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The proposed program will comply with the assessment process implemented by the NMIMT Graduate School.

In particular, operation and impact of the program will be assessed by collecting and analyzing data on:

- Quality of candidates entering the program, retention rates, program completion time, and graduation rates.
- Student academic and professional achievements including GPA, internships, licenses, awards, and scholarships.
- Dissemination of candidates' research results in peer-reviewed publications and presentations at professional meetings.
- Recommendations of candidates' graduate study committee.

The methods for program evaluation will include:

- Collecting and analyzing individual student data available in the institute's database.
- Collecting and analyzing information reflecting quality of instruction offered to candidates. This includes, but not limited to, assessment of meeting course and program learning outcomes, course evaluations and graduate student surveys.
- Analyzing post-graduate surveys completed by former students.
- Considering input from the Department of Mechanical Engineering advisory board (current membership of the advisory board listed in Appendix VIII).

H Administrative Responsibility for the Program and Institutional Commitment

Department of Mechanical Engineering at NMIMT manages the M.S. program with specializations in Explosives Engineering and Mechatronics Systems & Robotics. It is therefore natural for Mechanical Engineering department to assume administrative responsibility for the proposed Ph.D. program in Mechanical Engineering with

Dissertation in Intelligent Energetic Systems. In addition, it is projected that selected divisions of NMIMT, such as EMRTC and ICASA, will present their opinion on the program and contribute to developing and teaching courses and facilitating research in explosives and intelligent systems.

At the departmental level, a *Graduate Study Committee* will be formed to facilitate administration of departmental graduate programs. Responsibilities of the committee will include developing guidelines for the graduate study, approving policies and procedures for departmental graduate programs, and serving as an arbiter in resolving academic disputes and complains. To maintain a sharp focus on recruiting needs of regional employers, the *Graduate Study Committee* will regularly consult the Department of Mechanical Engineering external *Advisory Board* consisting of representative of regional business and national laboratories (see Appendix VIII for details). Finally, the Dean of Graduate Studies oversees all graduate programs at NMIMT.

Appendix I. NMIMT's Ph.D. in Mechanical Engineering with Specialization in Intelligent Energetic Systems Program Description

1. Admission to Ph.D. program: B.S. or M.S. (or equivalent) in engineering or closely related discipline with a recommended cumulative GPA of 3.3 out of 4.0. Non-engineering degrees may be considered upon review of credentials; additional course work may be required if an applicant demonstrates lack of knowledge in core subjects of the Intelligent Energetic Systems specialization. International students must present results of GRE and TOEFL or IELTS, which must meet the minimum University standards. Under exceptional circumstances requirements for GRE may be waived by faculty if a student shows adequate professional skills.
2. Qualifying examination: Before the beginning of their third semester students are required to sit for and pass written examinations in three of the following areas: Control theory, Dynamics, Thermodynamics, Fluid dynamics, Heat transfer, Mechanics of Materials, Structural Analysis. The exam questions will be written and graded by department faculty members. These exams will be used to evaluate the student's knowledge of mechanical engineering topics at the undergraduate level and their ability to a) apply advanced knowledge of mathematics, science, and engineering, b) identify, formulate, and solve engineering problems. Students failing to pass a subject exam are offered one opportunity to retake that exam at the next offering of the exam. Students that do not pass all three topic exams by the completion of their second attempt do not advance to candidacy, and will leave the program. The student will be able to pursue a M.S. in Mechanical engineering subject to those degree requirements.
3. Possible transfer of up to 12 credits from a previous academic program or degree is left to discretion of student's Advisory Committee. The transfer must be approved by the department chair and Dean of Graduate Studies.
4. During the first semester after passing the Qualifying examination a student's Advisory Committee is formed. A student and faculty suggests minimum of three (3) Mechanical Engineering faculty members and one faculty outside of the program. Faculty participation in the committee is voluntary. A chairman of the committee is typically a student's Academic Advisor. The Advisory Committee must be approved by the Mechanical Engineering Department Chair and the Dean of Graduate Studies.
5. During the first semester after passing the Qualifying examination a student must submit his/her program of study. The program of study includes all courses relevant to student's research topic.

At the time of submitting a program of study, student must indicate a tentative title of his/her dissertation and provide a brief description (1-2 paragraphs) of the dissertation research topic. The dissertation research topic must be approved by the student's Advisory Committee.

6. Candidacy examination (admission to Candidacy): This examination may be taken at any time after 12 months have passed since passing the Qualifying Exam. The focus of the examination is student's proposed Ph.D. dissertation. The examination consists of written and oral parts. The written part is student's dissertation proposal including statement of a research problem, relevant literature review and outline of the proposed work. The dissertation proposal is communicated to student's Advisory Committee two weeks prior to oral examination. Oral examination is closed to public and consists of 35-40 minutes presentation on the proposed research followed by questions from the advisory committee. Upon reviewing the written and oral portions of Candidacy examination, a committee elects one of the following options: (a) Pass, (b) Pass with conditions: student has 6 months to correct minor deficiencies, (c) Fail: Student does not advance to candidacy and will leave the program.
7. Doctoral dissertation and defense: The dissertation defense must not occur any sooner than 12 months after advancing to candidacy. At least one month prior to the dissertation defense, a student submits a Ph.D. dissertation package on the research topic approved by his/her Advisory Committee. The dissertation package is first submitted to student's advisory committee. The dissertation package includes (a) written dissertation, (b) student's CV with a list of publications on the dissertation topic, (c) copies of any papers published, accepted or submitted for publication in refereed journals acceptable to the doctoral committee (at least one of these papers must be published or accepted for publication in a peer reviewed journal) and (d) evidence of presenting results of the dissertation research at international, national and regional conferences. Some government publications (e.g. national laboratory reports) may be considered in lieu of journal articles if approved by student's Advisory Committee. Dissertation defense is announced 14 days before the actual presentation and is open to public. The defendant delivers 35-40 minutes talk on the results of the dissertation research. A slide discussing broad dissemination of the research results (i.e. through journal publications, conference participation or invited talks) must be included in the presentation. Committee members may ask additional questions during a part of dissertation defense closed to public. Within a week after the dissertation defense, the Advisory Committee submits an evaluation of the defense which may be (a) Pass, (b) Pass with conditions, minor revisions are needed, (c) Fail. In the case (c) Fail, a student will not be granted a Ph.D. in Mechanical Engineering with Dissertation in Intelligent Energetic Systems.

Appendix II. Intelligent Energetic Systems Specialization Faculty, Fall 2015

Full-time Faculty

Bakhtiyarov, Sayavur Ph.D., DSc Associate Professor	Non Newtonian Fluid Mechanics, Heat & Mass Transfer, Rheology, Multiphase Flow
Ford, Julie Ph.D., Professor	Written and Oral Communication, Teamwork, Communication Pedagogy
Ghosh, Ashok Ph.D., P.E., Associate Professor	Macro Behavior of Composites, Biomechanics, Finite Element Analysis
Grow, David Ph.D. Assistant Professor	Robotics, Biomedical & Surgical Devices, Haptics, Dynamic Modeling
Hargather, Michael Ph.D. Assistant Professor	Shock & Gas Dynamics, Experimental Fluid Dynamics, High Speed Gas Dynamics
Kimberley, Jamie Ph.D. Assistant Professor	Solid Mechanics, Impact Studies, Dynamic Behavior of Materials
Lim, Seokbin Ph.D. Associate Professor	Energetic Materials, Linear and Conical Shaped Charges, Explosives Technology
Mousavi, Arash Ph.D. Assistant Professor	Micro/Nano-Electro-Mechanical Systems (MEMS/NEMS), Bio-MEMS, Nanotechnology
Ostergren, Warren Ph.D. Professor	Structural Analysis, Machine Design, Propulsion & Power Systems
Ryu, Donghyeon Ph.D. Assistant Professor	Mechanics of Materials, Smart Materials & Structures, Advanced Sensing Technologies
Wei, Tie Ph.D. Assistant Professor	Thermal Fluid Science, Wall Bounded Flow, Flow Instabilities, Turbulent Mixing
Yilmaz, Nadir Ph.D., P.E. Associate Professor	Alternative Fuels, Computational Fluid Dynamics, Combustion & Chemical Kinetics
Zagrai, Andrei Ph.D. Associate Professor	Structural Health Monitoring, Intelligent Systems and Structures, Sensor Networks

Adjunct Graduate Faculty

William Anderson
Adjunct Professor

Detonation Physics

Edwin Bryce
Adjunct Professor

Geometric dimensioning and tolerancing, engineering design

Lawrence DeChant,
Adjunct Professor

Thermal-Fluid Sciences

Michael Fortner
Adjunct Professor

Energetic Materials: Initiation, Applications, and Systems

James Kennedy
Adjunct Professor

Basic Science and Applications of Explosives, Detonation in Explosives

A. Keith Miller
Adjunct Professor

System Dynamics, System Modeling and Simulation, Actuators and Actuator Controls

Wayne Rivera
Adjunct Professor

Energetic Materials, Explosives Technology

Jerome Stofleth
Adjunct Professor

Instrumentation and Measurements, Explosives Technology

Appendix IV. Curricula Vitae of Faculty

SAYAVUR I. BAKHTIYAROV

**New Mexico Institute of Mining and
Technology
Mechanical Engineering Department
122 Weir Hall, 801 Leroy Place
Socorro, NM 87801-4796
Ph: 575-835-5343; 575-517-9133 (cell)
Fax: 575-835-5209**

sayavur@nmt.edu
<http://infohost.nmt.edu/~sayavur/>

PERSONAL DATA

Citizenship: **US Citizen**
US Government Secret Clearance (last investigation March 2012)
Marital Status: Married, Two Children
Languages: Fluent in English, French, Russian, Turkish, Azeri

PRESENT POSITIONS

- ❖ Associate Professor (tenured), New Mexico Institute of Mining and Technology (Hispanic Serving Institution), Socorro, NM, USA

EDUCATION RECORD

Degree	Field	Institution	Year obtained
Sc. D.	Mechanical Engineering	Azerbaijan National Academy of Sciences, Baku and The Birmingham University, UK	1992
Ph. D.	Mechanical Engineering	Azerbaijan Institute of Oil and Chemistry, Baku and Institute of Thermophysics of Siberian Branch of Russian Academy of Sciences, Novosibirsk	1978
Eng Dipl.	Petroleum Engineering	Azerbaijan Institute of Oil and Chemistry, Baku	1974

ACADEMIC EXPERIENCE

01/05 - Present Associate Professor, Tenured Mechanical Engineering
Department, New Mexico Institute
of Mining and Technology

01/11 – 01/14	Chief Scientist (IPA)	(Hispanic Serving Institution), Socorro, NM
01/11 – 01/14	DOD Permanent Coordinator for Interagency Nuclear Safety Review Panel (INSRP)	DOD, HQ Air Force Safety Center/SES, Space Safety Division, Kirtland Air Force Base, NM Pentagon, Washington, DC
01/06 – 09/09	Department Chair	Mechanical Engineering Department, New Mexico Institute of Mining and Technology, Socorro, NM
12/99 – 01/05	Research Professor	Mechanical Engineering Department, Auburn University, AL
8/95 – 12/99	Senior Research Fellow	Space Power Institute, Auburn University, AL
2/95- 8/95	Visiting Professor	Mechanical Engineering Department, Auburn University, AL
9/86 – 3/87	Visiting Professor	Chemical Engineering Department East China University of Chemical Technology, Shanghai, China
9/81 – 7/82	Research Fellow	School of Chemical Engineering, Birmingham University, UK
2/78 - 1/95	Assistant Professor, Associate Professor, Professor, Chair	Mechanical Engineering Department, Azerbaijan State Oil Academy, Baku
3/75 – 1/78	Research/Teaching Assistant	Institute of Thermophysics of Siberian Branch of Russian Academy of Sciences, Novosibirsk
8/74 – 2/75	Research Fellow	Institute of Petroleum, Azerbaijan Academy of Sciences, Baku

CERTIFIED TRAINING

- ❖ ***Information Security “Cleared” Personnel Training***, 1st Quarter CY13, 377 ABW/IP 6-3973, February 6, 2013.
- ❖ ***DoD IAA Cyber Awareness Challenge (ZZ133098)***, December 9, 2013.
- ❖ ***Job Safety Training***, July 22, 2013.
- ❖ ***DoD Information Assurance Awareness (ZZ133098) Information Assurance Course***, Air Education and Training Command, December 19, 2012.
- ❖ ***Information Protection (ZZ133078)***, Air Education and Training Command, May 29, 2012; April 30, 2013.
- ❖ ***ORM Fundamentals***, Department of the Air Force, November 29, 2011.

- ❖ *DoD Information Assurance Awareness (ZZ133098)*, Air Education and Training Command, January 23, 2012.
- ❖ *Annual Ethics training*, Department of Defense, December 30, 2011.
- ❖ *Fire Extinguisher Safety (ZZ133080)*, Air Education and Training Command, December 28, 2011; July 22, 2013.
- ❖ *Environmental Management System – General Awareness Training*, Air Education and Training Command, December 28, 2011.
- ❖ *Human Relations (ZZ133080)*, Air Education and Training Command, February 11, 2011; December 19, 2012; December 9, 2013.
- ❖ *Safety & Accident Investigation Board President Course*, U.S. Air Force, Kirtland AFB, NM, Class 2012A, AFSC 810, PDS Code: SIP, 1-3 November 2011
- ❖ *Chief of Safety Course*, U.S. Air Force, Kirtland AFB, NM, Class 2012A, WCIP 05B, PDS Code: EAE, 25-28 October 2011
- ❖ *Anti-Phishing(Phishing Awareness)*, Department of Defense, CBT Training, September 12, 2011.
- ❖ *Personally Identifiable Information, Version 1.0*, Department of Defense, June 29, 2011.
- ❖ *Space System Safety Engineering Training Pilot Course*, U.S. Air Force/Space & Missile Systems Center (SMC)/NASA safety training Center, Peterson AFB, CO, May 9-13, 2011
- ❖ *Information Protection (ZZ133078)*, Air Education and Training Command, February 11, 2011.
- ❖ *Force Protection (ZZ133079)*, Air Education and Training Command, February 11, 2011; December 19, 2012; December 9, 2013.
- ❖ *DoD Information Assurance Awareness (ZZ133098) Information Assurance Course*, Air Education and Training Command, February 11, 2011.
- ❖ *Suicide Awareness (ZZ133113)*, Air Education and Training Command, February 11, 2011.

US Department of Defense AIR FORCE

- ❖ Reviewed Launch Approval Requirement for radioactive Materials Contained Aboard the Mccannon/University of Wisconsin Experiment on the 36.294 UH Research Rocket in December 2013.
- ❖ Reviewed Launch Forecast of Radioactive Materials for Space and Missile Systems Center (July 2013 - Sep 2013). The AEHF-3 Space Vehicle contains 990 micrograms of Rubidium 87 (Rb -87).
- ❖ NASA OSMA Nuclear Flight Safety Assurance Review Panel Member for NSLA for radioactive material aboard balloon launches.
- ❖ Review Panel Member for approval launch of radioactive material aboard research rockets at White Sands Missile Range (WSMR).

- ❖ Reviewed for conformance with Chapter 6, paragraph 6.3.3 of NPR 8715.3, NASA General Safety Program Requirements a launch of eight 55.2 micro Curie (total) of Cadmium-109 sources aboard NASA's 39.57 MCF Conventional Balloon in September 2013 from NASA's Balloon Launch Facility Fort Sumner, NM. Sponsored by Marshall Space Flight Center (MSFC).
- ❖ Reviewed Launch Approval Requirements for Radioactive Materials Contained Aboard the McCammon/University of Wisconsin Experiment on the 36.294 UH Research Rocket in December 2013.
- ❖ Provided seminars on "Safety Design for Space Operations" at Air Force Safety Center, Kirtland AFB, NM, June-August, 2013.
- ❖ Reviewed for conformance with Chapter 6 of NPR 8715.3, NASA General Safety Program Requirements a launch of two 200 micro Curie of Americium-241 sources aboard NASA's Proto Energetic X-ray Imaging Survey Telescope (ProtoEXIST) P2 Balloon in August-October 2012 from Fort Sumner, NM.
- ❖ Defense Weather Satellite Directorate (DWSD) System Safety Group (SSG). Review, share and address System Safety information/issues (activities, accomplishments, working or unresolved hazards, future anticipated tasks/hazard analyses, lessons learned, etc.), evaluate system safety program efforts, potential program hazard risks and a continuing life cycle requirement (AFI/SMC).
- ❖ Reviewed final report of the project "Reentry Breakup Recorder (REBR)", the Aerospace Corporation.
- ❖ Re-Entry Collision Avoidance (COLA) Working Group Member.
- ❖ Reviewed the Tasker: Public Release Coordination (PAIRS 2011-0168) "Mitigating Cyber Friendly Fire", D. H. Andrews and K. Jabbour (AIRL), March 21, 2011.
- ❖ Participated in "Advanced Extremely High Frequency (AEHF) Space Vehicle (SV) 1 Anomaly Investigation", March 2011.
- ❖ Launch WGS System Safety Group Member, 2011.
- ❖ MC System Safety Working Group Member(2011).
- ❖ Reviewed "Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems" (Air Force Instruction 91-110).
- ❖ Mars Science Laboratory Briefing to Dr. John P. Holdren, Director, White House Office of Science and Technology Policy, and Assistant to the President for Science and Technology (Washington, DC, June 1, 2011).

INDUSTRIAL EXPERIENCE

Research and Development for the following companies:

➤ *1995 – Present*

- ECLIPSE Aviation, Albuquerque, NM**(Flaps Design)
Arena-Flow, LLC, Albuquerque, NM (Sand Flow Simulations)
Ashland Chemical Co., Columbus, OH(Rheology of Resin Binders)
Bendix Commercial Vehicle Systems LLC, Elyria, OH (Prototype Casting)
CITATION Foam Casting Co., Columbiana, AL(Counter-Gravity Lost Foam Casting)
CMI Novacast, Inc., Elk Grove Village, IL(Refractory Coatings)
ECK Industries, Inc., Manitowoc, WI (Magnesium Lost Foam and V-Process Castings)
Energy Reclamation, LLC, Tulsa, OK(Enhanced Oil Recovery)
Ford Motor Co., Dearborn, MI(Transport Properties of Resin Bonded Sand)
FOSECO, Inc., Cleveland, OH(Exothermic Risers)
FOSECO-MORVAL, Inc., Guelph, ON, Canada(Lost Foam Coating)
General Motors Corp., Milford, NH(Lost Foam Casting)
Global Technology Transfer, Inc., Tulsa, OK (Chief Technology Officer and Chairman of the Scientific Advisory Board)
GM Powertrain, Defiance, OH(Sand Core Making)
Goldens' Foundry & Machine Co., Columbus, GA(Computer Modeling and Process Design)
Harmony Castings LLC, Harmony, PA (Vacuum Sealed Molding)
INTERMET Inc., Columbus, GA(Sand Coremaking Process)
Space Age Enterprise, Inc., Lawrenceville, GA (Magnesium V-Process)
LAEMPE+REICH CO., Trussville, AL(Sand Coremaking Process)
LPD Energy Company LLC, Muskogee, OK (ISGGT EOR Technology)
Material & Process Consultancy, Morton, IL(Fiber Reinforced Alloys)
NEPTUNE Technology Group LLC, Tallassee, AL (Sand Core Properties)
Southern Aluminum Castings, CITATION Co., Bay Minette, AL (Sand Core Hot Distortion)
Southeastern Foundry Products, Inc., Birmingham, AL(Refractory Coatings)
Southern Foundry Resins, Inc., Pelham, AL(Development of New Resin Binders and Refractory Coatings)
Vulcan Engineering, Pelham, AL(Sand Compaction)
UNIMIN Corp., Pittsburgh, PA(Sand Core Hot Distortion)
US Silica, Berkeley Springs, WV (Sand Core Hot Distortion)
Wise Alloys LLC, Muscle Shoals, AL (Reclamation)
- 1990 – 1995 – **PETROSUN International, Inc., USA** (Advanced Physico-Chemical Methods of Oil Extraction from Micropores)
 - 1992 – 1995 - **ZEEFAX Ltd., UK** (Development of New Type of Magnetic Flowmeter)
 - 1981-1982 – **Exxon, UK** (Development of Oil Lubricants with Polymeric Additives)
 - 1980 – 1995 - **Major state companies of the former USSR and Eastern Europe countries**

PATENTS

- ❖ 2006 - **A Valve-less Dual Chamber Micropump**, AU Technology Disclosure, pending patent (Co-authors: Z. Y. Cheng, B. A. Chin)

- ❖ 2006 - **A Valve-less Dual Diaphragm Micropump**, AU Technology Disclosure, pending patent (Co-authors: Z. Y. Cheng, B. A. Chin)
- ❖ 2006 - **A Valve-less Micropump with Dynamic Diaphragm**, AU Technology Disclosure, pending patent (Co-authors: Z. Y. Cheng, B. A. Chin)
- ❖ 2005 - **Fluidized Nanobed Cooling System for Microelectronics**, AU Technology Disclosure, pending patent (Co-authors: D. J. Kim, B. A. Chin)
- ❖ 2001 - **A New Sand Fill and Compaction Method in Lost Foam Process**, USA Patent Pending (Co-author: R. A. Overfelt)
- ❖ 2001 – **Telescopic Probe for On-Line Mold Quality Measurements**, USA Patent Pending (Co-author: R. A. Overfelt)
- ❖ 1999 – **A New Core-Blowing Method in Cold Box Processes**, USA Patent Pending (Co-author: R. A. Overfelt)
- ❖ 1999 – **A New Method to Prevent Clogging of Exhaust Vents in Cold Box Core Process**, USA Patent Pending (Co-author: R. A. Overfelt)
- ❖ 1999 - **Fiber Reinforced Sand-Binder System for Core-Making Process**, USA Patent Pending (Co-authors: R. A. Overfelt, S. Adanur)
- ❖ 1991 - SU (11) 1681072 A 1. **Device to Prevent the Hydraulic Pressure Losses in Sudden Contraction Sections of Pipelines**
- ❖ 1990 - SU (11) 1629640 A 1. **Drag Reducing Device in Pipelines**

The pending patents were undergoing in-plant tests by:

- ❖ FOSECO-MORVAL Inc., Guelph, ON, Canada
- ❖ Freeman Manufacturing and Supply Company (FREEMAN), Avon, OH
- ❖ Goldens' Foundry & Machine Co., Columbus, GA
- ❖ INTERMET Inc., Columbus, GA
- ❖ LAEMPE+REICH Co., Trussville, AL
- ❖ LPD Energy Company LLC, Muskogee, OK
- ❖ Neptune Technology Group, Tallassee, AL
- ❖ Southern Foundry Resins Inc., Pelham, AL
- ❖ Vulcan Engineering, Pelham, AL

AWARDS AND RECOGNITION

- 2015 **NASA Glenn Research Center Summer Fellowship**, Cleveland, OH
- 2014 Academician of **Russian Academy of Natural Sciences** named by Vernadsky
- 2013 Certificate of Appreciation, **United State Air Force**, Kurt F. Neubauer, Maj. General USAF Commander (Pentagon, Washington DC)
- 2012 NASA Headquarters' Certificate of Appreciation for contribution to the **Mars Science Laboratory Inter-Agency Nuclear Safety Review Panel** as a **DoD Coordinator** (Washington, DC)
- 2012 Certificate of Appreciation as a Topic Organizer for the **2012 ASME International Mechanical Engineering Congress & Exposition** (Houston, TX)
- 2011-2014 Intergovernmental Personnel Act Fellow, **DoD HQ U.S. Air Force**, Kirtland, NM
- 2010 **NASA Glenn Research Center Summer Fellowship**, Cleveland, OH

- 2008 **ASME Materials Division** Award for organizing “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium at the 2008 International Mechanical Engineering Congress & Exposition (Boston, MA)
- 2008 **ASME Materials Division** Award for organizing “Advances in Materials Processing Science” Symposium at the 2008 International Mechanical Engineering Congress & Exposition (Boston, MA)
- 2008 **Top 20% Reviewer** of Metallurgical and Materials Transactions
- 2007 **Academician of International Ecoenergy Academy** (Scientific Council of IEA, 12.24.2007, Protocol No. 068, Certificate IEA No. 85)
- 2007 **ASME Materials Division** Award for organizing “Advances in Materials Processing Science” Symposium at the 2007 International Mechanical Engineering Congress & Exposition (Seattle, WA)
- 2007 **NASA Certificate of Recognition**
- 2006 **Best Paper Award** of the **South American Electrochemical Society (SIBAE)**
- 2006 **NASA Certificate of Recognition**
- 2006 **ASME Materials Division** Award for organizing “Advances in Materials Processing Science” Symposium at the 2006 International Mechanical Engineering Congress & Exposition (Chicago, IL)
- 2003 **ASME International** Mechanical Engineering Congress and Exposition Award
- 2001 **Best Paper Award** of the **American Foundry Society**
- 2001 **International Medal for Scientific Excellence**
- 1996 Granted permanent residency in the US as a **Scientist of Extraordinary Ability**
- 1987 **USSR National Economy Achievements Award**
- 1982 Recipient of the Oil Academy’s **Outstanding Young Faculty Award**
- 1972 **Outstanding Student Doctoral Award** of the USSR Ministry of Education

WORKSHOPS AND PROFESSIONAL COURSES

- ❖ **Nuclear Safety Life Cycle Review Milestone Criteria Workshop**, NASAJet Propulsion Laboratory, Pasadena, CA, October 25, 2013.
- ❖ **1st Workshop on Development of a Tool for Aviation Risk Assessment due to Space Debris and Meteoroids**, 45th Space Wing, Patrick Air Force Base, FL, October 9-11, 2013.
- ❖ **NASA’s Mars 2020 Mission’s Science Definition Team (SDT) Report**, Washington DC, July 8, 2013.
- ❖ **Safety Design for Space Operations**, Air Force Safety Center, Kirtland AFB, NM, June-August, 2013.
- ❖ **International Workshop on Instrumentation for Planetary Missions (IPM-2012)**, NASA Goddard Space Flight Center, Greenbelt, Maryland, October 10-12, 2012.
- ❖ **4th IAASS Workshop on Launch and Re-entry Safety**, NASA Wallops Flight Facility, Virginia, USA, September 18-20, 2012
- ❖ **5th Georgian-German School and Workshop in Basic Science GGSWBS’12**, Tbilisi-Batumi, Republic of Georgia, August 5-18, 2012
- ❖ **3rd IAASS Workshop on Launch and Re-entry Safety**, Paris, France, October 12-14, 2011

- ❖ **Academic Programs in Space and Aerospace Safety conference/workshop organized by International Association for the Advancement of Space Safety (IAASS) and International Space Safety Foundation (ISSF), Intelsat Headquarters (Washington, DC), March 31, 2011**
- ❖ **The Joint Army-Navy-NASA-Air Force (JANNAF) 58th JANNAF Propulsion Meeting / 44th Combustion / 32nd Airbreathing Propulsion / 32nd Exhaust Plume and Signatures / 26th Propulsion Systems Hazards Joint Subcommittee Meeting, Arlington, VA, April 18-22, 2011**
- ❖ **Theory and Practical Applications of Global Imaging – Particle Image Velocimetry (PIV), Stereoscopic Particle Image Velocimetry (Stereo PIV), and Planar Laser-Induced Fluorescence (PLIF), TSI, Inc., Minneapolis, MN, October 2009**
- ❖ **Southwestern Petroleum Short Course, Petroleum Industry of West Texas & Texas Tech University, Lubbock, TX, April 22-23, 2009**
- ❖ **Self-Healing Materials Workshop, BOEING, Seattle, WA, January 20-21, 2009**
- ❖ **Canadian Institute’s Enhanced Oil Recovery Conference, Calgary, Alberta, Canada, April 30 – May 2, 2008**
- ❖ **Southwestern Petroleum Short Course, Petroleum Industry of West Texas & Texas Tech University, Lubbock, TX, April 21-24, 2008**
- ❖ **Workshop “Improved Oil Recovery”, Society of Petroleum Engineers, Tulsa, OK, April 22-26, 2006**
- ❖ **Workshop “PTTC DOE CO₂ Enhanced Oil Recovery”, U.S. Department of Energy, Houston, TX, February 22, 2006**
- ❖ **Workshop “NSF/NM EPSCOR”, Albuquerque, NM, 2006**
- ❖ **Workshop “Magnetically Levitated Trains (MAGLEV) in New Mexico”, Los Alamos National Laboratory, Los Alamos, NM, 2006**
- ❖ **Professional Course “Design and Production of Magnesium Castings”, AFS/Cast Metals Institute, Inc., Livonia, MI**
- ❖ **Conference-Workshop “Strategic Research to Enable NASA’s Exploration Missions”, NASA, Cleveland, OH**
- ❖ **Workshop “Electric and Magnetic Phenomena in Micro- and Nano-Scale Systems”, ASME, New Orleans, LA**
- ❖ **CFD Workshop, ASME, Charlotte, NC**
- ❖ **Professional Course “FLOW-3D”, Flow Science, Inc., Los Alamos, NM**
- ❖ **Showcasing the Process - “Lost Foam”, AFS International Conference, Birmingham, AL**
- ❖ **Professional Course “Core-making Materials and Methods”, Cast Metal Institute, Inc., Des Plaines, IL**
- ❖ **Professional Course “SOLARTRON”, ZEEFAX Ltd., Moscow, USSR**
- ❖ **Workshop “Continua Mechanics”, Academy of Sciences of USSR, Perm, USSR**
- ❖ **Workshop “Thermophysical Properties of Crude Oil in Reservoir”, State Oil Company, Kiev, Ukraine**
- ❖ **Workshop “Rheology of Oil”, Exxon Co., Shell Co., Imperial College, London, UK**

TEACHING EXPERIENCE

1/05 to present New Mexico Institute of Mining and Technology, Socorro, NM

Courses taught

AE 415	- Aerodynamics II
AE 414	- Aerospace Structure
AE 489	- Aerospace Safety
ES216	- Engineering Fluid Mechanics
ES 302	- Mechanics of Materials
ES302L	- Mechanics of Materials Lab
ES 303	- Engineering Dynamics
ES 489	- Compressible Fluid Flow
MENG 351L	- Fluid & Thermal Sciences Lab
MENG 451	- Design of Machine Elements
MENG 489	- Machining & Metalworking Technology
MENG 556	- Advanced Compressible Fluid Flow
MENG 558	- Non-Newtonian Fluid Mechanics
MENG 577	- Multiphase Flow
MENG 577	- Advanced Fluid Mechanics
MENG 589	- Graduate-Faculty Seminar
EM 581	- Non-Newtonian Fluid Flow

2/95 to 12/04

Courses taught:

Auburn University, AL, USA

MECH 3130	- Mechanics of Materials
MECH 2110	- Statics and Dynamics
ENGR 2010	- Thermodynamics
MECH 3030	- Fluid Mechanics
MECH 6016	- Compressible Fluid Flow (Gas Dynamics)

2/78 to 2/95

Assistant Professor, Associate Professor, Professor, Chair, State Oil Academy, Baku, USSR

Undergraduate Courses Taught:

- ❖ Computer Design of Polymer Processing
- ❖ Computational Fluid Dynamics
- ❖ Heat and Mass Transfer
- ❖ Materials and Properties
- ❖ Dynamics: Kinematics and Statics

Graduate Courses Taught:

- ❖ Process Modeling and Optimization
- ❖ Compressible Fluid Flow
- ❖ Computational Fluid Dynamics (advanced)
- ❖ Turbulence
- ❖ Boundary Layer Theory
- ❖ Biorheology and Applications
- ❖ Non-Newtonian Fluid Mechanics
- ❖ Polymer Technology

- 9/93 to 2/95 Professor, Khazar University, Baku, Azerbaijan
 ❖ Mechanics of Materials
 ❖ Environmental Fluid Mechanics
- 9/86 to 4/87 Research Fellow, Chemical Engineering Department, East China
 University of Chemical Technology, Shanghai, China
 ❖ Fluid Mechanics
 ❖ Polymer Technology
 ❖ Heat Transfer
- 9/81 - 7/82 Research Fellow, School of Chemical Engineering, Birmingham
 University, Birmingham, UK
 ❖ Polymer Rheology
 ❖ Rheology of Crude Oil

GRADUATE STUDENT THESIS COMMITTEE MEMBER

- ❖ New Mexico Tech:
 - ❖ Miquela Trujillo, MS
 - ❖ Francisco Vigil, MS
 - ❖ Jasent G. Quintana, MS, “Byproduct Flow Modification Using C-D Nozzles for Thermal Processing Unit (TPU)”
 - ❖ Juan-Antonio Vigil, MS
 - ❖ Clay Thompson, MS, “Two Dimensional, PBX-9404 Line Wave Generator Initiated by Explosive Driven Polyethylene Flyer” (Thesis committee member)
 - ❖ Jon Manuel, MS, “Verification of the Hexshell-8 Solid-Shell Element”
 - ❖ Sean Wentworth, MS
 - ❖ Rufus Cooksey, “A Propellant Driven Helical Flux Compression Generator”, MS (2011)
 - ❖ Joel Williams, MS
 - ❖ Jake Scarbrough, MS (Engineering Management)
 - ❖ Ricardo M. Garcia, “Effectiveness of Modeling Composite Shell Structures Using Hex Shell Elements”, MS (2009)
 - ❖ Derek Doyle, “SHM of Satellite Joints”, MS (2008)
 - ❖ Matthew A. Risenmay, “Requirements-Driven Shaped Charge Design for Large Diameter Penetrations into Geological Materials”, MS (2008)
 - ❖ Jason Matthew, “Shock Vibrations Characteristics of a Bio-Inspired Structure under Blast Loading”, MS (2008)
 - ❖ Bruce L. Baker, “Design Study for Wireless Data Retrieval from Intelligent Data Logger”, MS (2006)
 - ❖ Derek S. Wartman, “Electrical Control System Upgrade for Active Cooling”, MS (2006)
- ❖ Auburn University, AL:
 - Member of the thesis committees of four MS graduate students
- ❖ Azerbaijan State Oil Academy:

- Chairperson of the thesis committees of fifteen (4 Sc. D. and 11 Ph.D.) graduate research students
- Member of the thesis committees of twelve (5 Sc. D. and 7 Ph.D.) graduate students

SUPERVISION OF GRADUATE STUDENTS

- ❖ Graduate students at NMT:
 - 1) Christopher Frederick (MS)
 - 2) David Chavez (MS)
 - 3) Rufus Cooksey (MS) – Graduated in November 2011
 - 4) Leroy Garley (MS)
 - 5) Jay Kenady (MS)
 - 6) John Miorris (MS)
 - 7) Tomas Sanchez (MS)
 - 8) Eric Van De Mark (MS)
 - 9) Arthus Weber (MS)
 - 10) Onur Coskun (MS) – Graduated in May 2007
 - 11) Amir Ghadimipour (MS) – Graduated in November 2007
 - 12) Emrah Kulunk (MS) – Graduated in December 2009
 - 13) Emrah Kulunk (PhD)
 - 14) Joel Williams (MS)
 - 15) David Peterson (MS)
 - 16) Benjamin Yeamans (MS)
 - 17) Douglas Coldwell (MS)
 - 18) Jamie Gumina (MS)
 - 19) Murad Aliyev (MS)
 - 20) Antonio Calva (MS)
 - 21) Elizabeth Francois (MS)
 - 22) Stephen Graham (MS)
 - 23) Hugo Loya (MS)
 - 24) Brandon Moore (MS)
 - 25) Matthew Risenmay (MS)
 - 26) Jeffrey Smith (MS)
 - 27) Jonathan Zucker (MS) - “Thermal Effects on the Initiation and Performance of Non-Electric Detonators Containing Primary and Secondary Explosives”, 2007
- ❖ Six (6) Graduate (Ph.D.) Research Projects
 - 1) Dupac, M., “Image Analysis Technique for Thermal Expansion Measurements” – 2005
 - 2) Teodorescu, S. G., “Electrical Conductivity of Molten Metals” - 2002
 - 3) Suleymanov, T. S., “Combustion Synthesis of Polymer Composites” - 1994
 - 4) Gurbanov, S. R., “Microstructural Analysis and Characterization of Polymeric Materials” – 1992
 - 5) Suleymanzade, N. S., “Heat and Mass Transfer in Eddy Flows of Viscoelastic Fluids” – 1993
 - 6) Askerov, B. A., “Thermodynamics of Fluid Flow in Micro Pores” - 1990

- ❖ Fifteen (15) Materials Engineering Graduate (M. Sc.) Research Projects
- ❖ Sixteen (16) Materials Engineering Undergraduate Research Interns
- ❖ Twenty-five (25) Undergraduate students in their Senior Design Projects
- ❖ Twenty-two (22) Undergraduate students in their Special projects

COLLEGE AND DEPARTMENT COMMITTEES

- ❖ NMT Chairs Council Member, 2006 – 2009
- ❖ NMT Graduate Council Member, 2006 - 2009
- ❖ Grand Awards Judge for the Intel International Science and Engineering Fair, Albuquerque, New Mexico, May 15-16, 2007
- ❖ NMT Library Advisory Committee Member, May 2005 - present
- ❖ Organizer of “Exploration Day – 2005” for Mechanical Engineering Department
- ❖ Judge of the 46th Annual NWNM Regional Science and Engineering Fair, University of New Mexico, Albuquerque, March 17-19, 2005
- ❖ Member of the Auburn University Scholarship Committee, 2003-2005
- ❖ Member of the Auburn University Instrumentation Committee, 2001-2003
- ❖ Honors and Awards Committee in Mathematics and Mechanics, Supreme Attestation Committee of Azerbaijan Republic, 1992-1995
- ❖ Honors and Awards Committee in the Mechanical Engineering Department at the State Oil Academy, 1985-1995
- ❖ Chair of the Rheology Society at the State Oil Academy, 1990-1992
- ❖ Academic Council’s Member in the Mechanical Engineering Department at the State Oil Academy, 1985-1995
- ❖ Mechanical Engineering Department’s Representative to the Oil Academy Council on Teaching Evaluation, 1992-1994

PROFESSIONAL ACTIVITIES

- ❖ Topic co-organizer of “The 22nd Symposium on Fluid Mechanics and Rheology of Non-linear Materials and Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Houston, TX, November 13-19, 2015
- ❖ Topic co-organizer of “The 15th Symposium on Advances in Materials Processing Science and Manufacturing”, ASME International Mechanical Engineering Congress and Exposition, Houston, TX, November 13-19, 2015
- ❖ Governing Council Member at Albuquerque School of Excellence (ASE), 2011-present
- ❖ Editorial Board Member of the **Journal of Space Safety Engineering (JSSE)**
- ❖ Editorial Board Member of the **Proceedings of the National Academy of Sciences of Azerbaijan (Science: Physics and Mathematics series)**
- ❖ Editorial Board Member of the **Proceedings of the Institute of Mathematics and Mechanics, National Academy of Sciences of Azerbaijan (PIMM), Journal of Mechanics.**
- ❖ Topic co-organizer of “The 20th Symposium on Fluid Mechanics and Rheology of Non-linear Materials and Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, San Diego, CA, November 15-21, 2013

- ❖ Judge at the NM Mathematics, Engineering, Science, Achievements (MESA) Competition, 25th Annual MESA Day, Albuquerque, NM, February 5, 2013
- ❖ Program Committee member of the 6th IAASS International Space Safety Conference "Safety is Not an Option", Montreal, Canada, May 21-23, 2013
- ❖ Topic co-organizer of “The 19th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Houston, TX, November 9-15, 2012
- ❖ Topic co-organizer of “the 13th Symposium on Advances in Materials Processing Science and Manufacturing”, ASME International Mechanical Engineering Congress and Exposition, Houston, TX, November 9-15, 2012
- ❖ Member of MILSATCOM System Safety Group (SSG)
- ❖ Topic co-organizer of “Symposium on Transport Phenomena in Manufacturing Processes”, ASME Fluids Engineering Division Summer Meeting, Puerto Rico, USA, July 8-12, 2012
- ❖ Co-organizer of “3rd IAASS Workshop on Launch and Re-entry Safety”, Paris, France, October 12-14, 2011
- ❖ Topic co-organizer of 18th Symposium on “Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November 11-17, 2011
- ❖ Coaching Socorro High School’s Renewable Energy design Project team for New Mexico Mathematics, Engineering, Sciences, Achievement (MESA) competition (May – June, 2011)
- ❖ Topic co-organizer of “10th Symposium on Transport Phenomena in Materials Processing and Manufacturing Processes”, ASME-JSME-KSME Joint Fluids Engineering Conference, Hamamatsu, Japan, July 24-29, 2011.
- ❖ Topic co-organizer of “11th Symposium on Advances in Materials Processing Science”, ASME International Mechanical Engineering Congress and Exposition, Vancouver, BC, Canada, November 12-18, 2010
- ❖ Topic co-organizer of “17th Symposium on the Fluid Mechanics and Rheology of Complex Fluids and Nonlinear Materials”, ASME International Mechanical Engineering Congress and Exposition, Vancouver, BC, Canada, November 12-18, 2010
- ❖ Topic co-organizer of “10th Symposium on Advances in Materials Processing Science”, ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, FL, 2009
- ❖ Topic co-organizer of “16th Symposium on the Fluid Mechanics and Rheology of Complex Fluids and Nonlinear Materials”, ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, FL, 2009
- ❖ Coordinator of “8th Symposium on Transport Phenomena in Manufacturing Processes”, ASME Fluids Engineering Division Summer Meeting, Vail, CO, August 2-5, 2009
- ❖ Panel Reviewer, National Science Foundation, Washington DC, February 18-19, 2010.
- ❖ Panel Reviewer, National Science Foundation, Washington DC, January 15-17, 2009.
- ❖ Panel Reviewer, National Science Foundation, Washington DC, January 10-12, 2009.

- ❖ Topic co-organizer of “9th Symposium on Advances in Materials Processing Science”, ASME International Mechanical Engineering Congress and Exposition, Boston, MA, 2008
- ❖ Topic co-organizer of “15th Symposium on the Fluid Mechanics and Rheology of Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Boston, MA, 2008
- ❖ Topic co-organizer of “7th Symposium on Transport Phenomena in Manufacturing Processes”, ASME Fluids Engineering Division Summer Conference, Jacksonville, FL, 2008
- ❖ Topic co-organizer of “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Seattle, WA, 2007
- ❖ Topical co-organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Seattle, WA, 2007
- ❖ Symposium coordinator of “Flows in Manufacturing Processes” Symposium, ASME Joint U.S.-European Fluids Engineering Summer Meeting, Miami, FL, 2006
- ❖ Organizer of workshop “Remotely Accessible Lab”, Socorro, NM, December 6, 2006
- ❖ Topic co-organizer of “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, 2006
- ❖ Topical co-organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, 2006
- ❖ Editorial Board Member of **International Journal of Recent Advances in Mechanical Engineering (IJMECH)**
- ❖ Editorial Board Member of **Journal of Space Safety Engineering (JSSE)**
- ❖ Editorial Advisory Board Member of **Asian Review of Mechanical Engineering (ARME)**
- ❖ Editorial Board Member of **i-manager's Journal on Engineering and Technology (IJET)**
- ❖ Editorial Board Member of **i-manager's Journal on Future Engineering and Technology (IJFET)**
- ❖ Editor in Chief of the **International Journal of Manufacturing Science and Technology (IJMS&T)**
- ❖ Editor in Chief of the **International Journal of Mechanics and Solids (IJM&S)**
- ❖ Editorial Board Member of **Journal of Mathematics Applied in Science and Technology (MAST)**
- ❖ Editorial Board Member of **International Journal of Applied Engineering Research (IAER)**
- ❖ Editorial Board Member of **International Journal of Dynamics of Fluids (IJDF)**
- ❖ Editorial Board Member of **Far-East Journal of Mathematics (FEJM)**
- ❖ Member of Professional Societies:
 - Society of Petroleum Engineers (SPE)
 - Air Force Association
 - The British Society of Rheology (BSR)

- Russian Society of Rheology (RSR)
- American Institute of Chemical Engineers (AIChE)
- American Society of Mechanical Engineers (ASME)
- American Foundry Society (AFS)
- The Society of Rheology of the American Institute of Physics (SR AIP)
- New York Academy of Sciences (NY AS)
- The American Association for the Advancement of Science (AAAS)
- ❖ Lead organizer of “Flows in Manufacturing Processes” Symposium, ASME Fluid Engineering Summer Conference, Houston, TX, 2005
- ❖ Lead organizer of “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, 2004
- ❖ Lead organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, 2004
- ❖ Lead organizer of “Flows in Manufacturing Processes” Symposium, ASME Heat Transfer/Fluid Engineering Summer Conference, Charlotte, NC, 2004
- ❖ Lead organizer of “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Washington, DC, 2003
- ❖ Lead organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Washington, DC, 2003
- ❖ Lead organizer of “Poster Session”, 4th ASME - JSME International Mechanical Engineering Congress and Exposition, Washington, DC, 2003
- ❖ Lead organizer of 4th ASME/JSME Joint Fluids Engineering Conference, Honolulu, Hawaii, 2003
- ❖ Lead organizer of “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2002
- ❖ Lead organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2002
- ❖ Lead organizer of “Electric and Magnetic Phenomena in Micro- and Nano-Scale Systems” Workshop, ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2002
- ❖ Lead organizer of “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, New York, NY, 2001
- ❖ Member of ASME Fluid Engineering Technical Committee, 2000 to Present
- ❖ Member of AFS Magnesium Casting Division Committee, 2000 to Present
- ❖ Member of AFS Engineering Division Committee, 1999 to Present
- ❖ Member of ASME Fluid Applications and Systems Technical Committee, 1999 to Present
- ❖ Program Committee Member of ASME Petroleum Division ETCT’99 Conference & Exhibition, Houston, TX, 1999

- ❖ Program Committee Member of ASME Petroleum Division Energy Week'97 Conference & Exhibition, Houston, TX, 1997
- ❖ Science & Technology Advisory Council of NASA, Huntsville, AL, 1997
- ❖ Program Committee Member of the Forum on Heat Transfer in Non-Newtonian Systems of Oil Production, USSR, 1989
- ❖ Program Committee Member of the Conference on Thermodynamics of Anomalous Systems, USSR, 1986
- ❖ Program Committee Member of the Forum on Rheology: Polymers and Oil, RSR Summer Annual Meeting, USSR, 1977

TECHNICAL SESSIONS CHAIRED

- ❖ 6th IAASS Conference “Safety is Not an Option”, Montreal, Canada, May 21-23, 2013. Session 17: Nuclear Safety for Space Systems.
- ❖ 18th Symposium on “Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November 11-17, 2011.
- ❖ 12th Symposium on “Advances in Materials Processing Science and Manufacturing”, ASME International Mechanical Engineering Congress and Exposition, Denver, CO, November 11-17, 2011 (assigned)
- ❖ “Symposium on Transport Phenomena in Manufacturing Processes”, ASME Fluids Engineering Division Summer Meeting, Vail, CO, August 2-5, 2009
- ❖ “9th Symposium on Advances in Materials Processing Science”, ASME International Mechanical Engineering Congress and Exposition, Boston, MA, 2008
- ❖ “15th Symposium on the Fluid Mechanics and Rheology of Complex Fluids”, ASME International Mechanical Engineering Congress and Exposition, Boston, MA, 2008
- ❖ 6th Symposium on Transport Phenomena in Manufacturing Processes, 5th Joint 2007 ASME/JSME Fluids Engineering Summer Meeting, San Diego, CA, July 30-August 2, 2007
- ❖ “Magnesium Division”, 109th Metalcasting Congress and CastExpo, St. Louis, MO, April 16-19, 2005
- ❖ “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, 2004
- ❖ “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, 2004
- ❖ “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, Washington, DC, 2003
- ❖ “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, Washington, DC, 2003
- ❖ “Flows in Manufacturing Processes” Symposium, 4th ASME/JSME Joint Fluids Engineering Conference, Honolulu, Hawaii, 2003
- ❖ “Advances in Materials Processing Science” Symposium, ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2002
- ❖ “Rheology and Fluid Mechanics of Nonlinear Materials” Symposium, ASME International Mechanical Engineering Congress and Exposition, New York, NY, 2001

- ❖ “Experiments in Fluid Mechanics” Symposium, 20th Southeastern Conference on Theoretical and Applied Mechanics, Pine Mountain, GA, 2000
- ❖ “Electro-Magneto-Hydrodynamics” Symposium, 3rd ASME/JSME Joint Fluids Engineering Conference and FED Summer Meeting, San Francisco, CA, 1999
- ❖ “Fluid Mechanics”, Second International Symposium on Mathematical and Computational Applications, Baku, Azerbaijan, 1999
- ❖ “Aeration Technology”, ASME Fluids Engineering Division, Summer Meeting, Washington DC, 1998
- ❖ “Drilling and Production Operations”, Energy Week Conference, Houston, Texas, 1996
- ❖ “Thermophysical Properties of Drilling Fluids”, International Conference on Mechanics of Drilling, Grozny, USSR, 1991
- ❖ “Heat Transfer Phenomena in Manufacturing”, International Conference on Relaxation Phenomena and Properties of Polymers, Voronezh, USSR, 1990
- ❖ “Polymer Rheology and Heat and Mass Transfer Phenomena”, IV National Conference on Mechanics of Anomalous Systems, Baku, USSR, 1986
- ❖ “Thermophysical Properties of Viscoelastic Lubricants”, National Conference on Wear of Machines and Methods of Protection, Bryansk, USSR, 1985

LIST OF PUBLICATIONS

a) Refereed Scholarly Journals

1. S. I. Bakhtiyarov, E. R. Kutelia and C. Frederick, 2015, “Thermo-Rheometric Studies of Newly Developed Nanolubricants”, **International Journal of Applied Engineering Research (IJAER)** (accepted).
2. R. N. Ibragimov and S. I. Bakhtiyarov, 2015, “Multidimensional Wave Fronts Propagation along the Beams Corresponding to the Approximated Thermodynamic Model Associated with a Rotating Detonation Engines”, **Journal of Applied Nonlinear Dynamics (JAND)**, Vol. 4, No. 4, pp. 427-439.
3. R. M. Sattarov, S. I. Bakhtiyarov and R. N. Ibragimov, 2015, Modeling of Complex Rheological Fluids with Fractal Structures, **Journal of Discontinuity, Nonlinearity, and Complexity** (submitted).
4. R. M. Sattarov and S. I. Bakhtiyarov, 2015, Some Specifics of Modeling of Complex Rheological Fluids with Fractal Structures, **i-manager's Journal on Future Engineering & Technology**, Vol. 10, No. 4, pp. 1-7.
5. R. S. Qurbanov, N. B. Nasibov and S. I. Bakhtiyarov, 2014, “A Novel Approach for Optimization of Gas Lift System: Pilot Tests Results”, **i-manager's Journal on Future Engineering & Technology**, Vol. 9, No. 2, pp. 9-14.
6. E. R. Kutelia, S. I. Bakhtiyarov, O. O. Tsurtsumia, A. S. Bakhtiyarov, B. Eristavi 2014, “Self-Healing Metal/Ceramic Composite”, **Bulletins of Russian Academy of Natural Sciences: Innovative Technologies**, Vol. 1, pp. 11-15 (in Russian).

7. G. M. Panakhov, E. M. Abbasov, N. N. Abbasova and S. I. Bakhtiyarov, 2014, "Hydrodynamic Methods of Extraction of Immobile Hydrocarbon Liquids in Inhomogeneous Capillaries", **i-manager's Journal on Future Engineering & Technology**, Vol. 9, No. 4, pp. 1-8.
8. G. M. Panakhov, E. M. Abbasov, S. I. Bakhtiyarov, G. R. Agayeva, G. A. Aliyev and S. R. Rasulova, 2013, "A Novel Moist Carbon Dioxide Generation Enhanced Oil Recovery Technology", **J. of Discontinuity, Nonlinearity, and Complexity** (<https://lhscientificpublishing.com/Journals/DNC-Default.aspx>) (ISSN:2164-6376), Vol. 2, No. 4, pp. 401-410.
9. S. I. Bakhtiyarov, G. M. Panakhov, E. M. Abbasov, G. R. Agayeva, G. A. Aliyev and S. R. Rasulova, 2013, "Future Generation of Enhanced Oil Recovery", **i-manager's Journal on Future Engineering and Technology**, November 2012-January 2013 Issue No. 2, Vol. 8, pp. 10-16.
10. G. M. Panakhov, E. M. Abbasov, S. I. Bakhtiyarov, G. R. Agayeva, G. A. Aliyev and S. R. Rasulova, 2013, "Enhanced Oil Recovery Using Natural Gas-Generating Minerals", **SPE Journal**, ID # SJ-0612-0033 (submitted).
11. U. F. Nasirov and S. I. Bakhtiyarov, 2012, "Application of Statistical Analysis System for Explosives Effects of Camouflet Deep-Hole Charges", **i-manager's Journal on Future Engineering and Technology**, May-July Issue No. 4, Vol. 7, pp. 39-43.
12. E. R. Kutelia, L. N. Rukhadze, N. I. Maisuradze, G. V. Kukhalashvili, T. A. Dzigrashvili, T. G. Kukava and S. I. Bakhtiyarov, 2012, "The Mechanism of Core-Shell Type Magnetic Carbon Nano-Particles Formation on the Surface of Ferromagnetic Metal Plate Substrates", **Georgian Engineering News**, No. 2.
13. L. Rukhadze, E. R. Kutelia, N. Maisuradze, B. Eristavi and S. I. Bakhtiyarov, 2012, "A Novel Radiation Shielding Nano-Composite Material for Space Exploration", **Journal of Energy and Power Engineering** (submitted, Paper # JEPE12041701).
14. U. F. Nasirov and S. I. Bakhtiyarov, 2012, "The Study of the Radius Explosion Effect Change of Camouflet Deep-Hole Charges and the Depth of Flowing Ground Compaction at Using Different Types of SAS Solutions", **International Journal of Manufacturing Science and Technology**, No. 1, Vol. 6, pp. 91-97.
15. S. I. Bakhtiyarov, 2011, "Hybrid System of Gas-Acid-Polymer Enhanced Oil Recovery Technology", **International Journal of Drilling and Exploration World (DEW)**, June, pp. 33-38.
16. S. Ward, N. Yilmaz and S. I. Bakhtiyarov, 2011, "A Novel Flapping Wing Mechanism for Micro Air Vehicles (MAVs)", **Aerospace Science and Technology**, Elsevier Ltd (submitted).
17. L. N. Rukhadze, E. R. Kutelia, N. I. Maisuradze, B. G. Eristavi and S. I. Bakhtiyarov, 2010, "Magnetic Carbon Nanopowders", **Journal of Materials Science and Engineering**, Vol. 4, No. 2, pp. 75-80.
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19. R. S. Qurbanov, N. B. Nasibov and S. I. Bakhtiyarov, 2010, "A Novel Approach in Gas-Lift Wells Studies", **Journal of Materials Science and Engineering**, Vol. 4, No. 2, pp. 93-102.

20. E. R. Kutelia, S. I. Bakhtiyarov, M. N. Okrosashvili, O. O. Tsurtsunia, B. P. Bulia, A. S. Bakhtiyarov and B. G. Eristavi, 2010, "Development of High-Temperature Corrosion and Creep Resistant Nb, Mo and Cr based Compositions with Protective Self-Healing Coating of Fe-45%Cr-4%Al-1%Ni-0.3%La Alloy", **Journal of Materials Science and Engineering** (submitted).
21. E. R. Kutelia, S. I. Bakhtiyarov, O. O. Tsurtsunia, A. I. Bakhtiyarov and B. Eristavi, 2010, "Development of High Temperature Self-Healing Coating Systems", **International i-Manager's Journal on Future Engineering & Technology**, Vol. 5, No. 3, pp. 9-12.
22. R. N. Ibragimov, N. H. Ibragimov, S. I. Bakhtiyarov, S. Pantic, A. S. Bakhtiyarov, G. Leguy and E. Ovaska, 2009, "Latitude Anomaly as An Alternative Answer to The Question Put by K.G. Lamb 5 Years Ago on Thorpe's Modeling of Interaction of Internal Waves Reflecting from Sloping Boundaries in The Ocean", **Journal of Ocean Modeling** (submitted).
23. L.N. Rukhadze, E. R. Kutelia, N. I. Maisuradze, B. G. Eristavi and S. I. Bakhtiyarov, 2009, "Preparation and Characterization of Carbon Nanoparticles Doped with Magnetic Clusters", **Georgian Engineering News**, No. 4, pp. 56-59.
24. S. I. Bakhtiyarov and D. A. Siginer, 2009, "Electromagnetic Levitation. Part III: Thermophysical Property Measurements in Microgravity", **Journal of Fluid Dynamics & Materials Processing**, Vol. 5, No. 1, pp. 1-23.
25. E. Kutelia, O. Tsurtsunia, S. I. Bakhtiyarov, H. Adanir, B. Bulia, O. Mikadze and B. Eristavi, 2009, "Obtaining the Self-Organizing Thin Protective Thermal-Barrier and Tribological Coatings on the Surface of Fe-44%Cr-4%Al-0.3%La Alloy", **Journal of Plasma Processes & Polymers (Wiley-VCH)** (submitted).
26. S. I. Bakhtiyarov and D. A. Siginer, 2008, "Electromagnetic Levitation, Part I: Theoretical and Experimental Considerations", invited paper, **Fluid Dynamics and Materials Processing**, Vol. 4, No. 2, p. 99-112.
27. S. I. Bakhtiyarov and D. A. Siginer, 2008, "Electromagnetic Levitation, Part II: Thermophysical Property Measurements in Terrestrial Conditions", invited paper, **Fluid Dynamics and Materials Processing**, Vol. 4, No. 3, p. 163-184.
28. S. I. Bakhtiyarov, G. M. Panakhov and E. M. Abbasov, 2008, "A New VOC Emissions Technology", **International Journal of Manufacturing Science and Technology**, Vol. 2, No. 1, pp. 1-9.
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30. A. Kh. Shakhverdiyev, I. E. Mandrik, G. M. Panakhov, S. I. Bakhtiyarov and E. M. Abbasov, 2007, "Perspectives of Rheogazochemical Enhanced Oil Recovery Technology for Extraction Residual Carbohydrates Reserves", **Proceedings of Azerbaijan National Academy of Sciences, The Earth Sciences Series**, No. 3, pp. 38-47 (in Russian).
31. S. I. Bakhtiyarov, R. Grigg, R. Svec and O. Coskun, 2007, "Experimental Study of Salinity Effect on In-Situ Generated Carbon Dioxide", **International Journal of Manufacturing Science and Technology**, Vol. 1, No. 1, June, pp. 47-59.
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International Journal of Manufacturing Science and Technology, Vol. 1, No. 1, June, pp. 1-11.

33. S. I. Bakhtiyarov and R. A. Overfelt, 2007, "A New Sand Fill and Compaction Method in Lost-Foam Process", **NASA Tech Brief**, MFS-31679-1.
34. G. M. Panakhov, S. I. Bakhtiyarov, A. Kh. Shakhverdiyev and E. M. Abbasov, 2006, "Kinetics of Gas Generation in Water Solution", **Transactions of Azerbaijan National Academy of Sciences. Issue: Mathematics and Mechanics Series of Physical-Technical & Mathematical Science**, Vol. 26, No. 4, pp. 239-246.
35. A. Kh. Shakhverdiyev, G. M. Panakhov, E. M. Abbasov, I. E. Mandrik and S. I. Bakhtiyarov, 2006, "Integrative Efficiency of Bed Stimulation at Intrastratal Gas Generation", **Oil Industry Journal**, No. 11, pp. 76-78 (in Russian).
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38. E. R. Kutelia, O.O. Tsurtsunia, B.G. Eristavi, H. Adanir and S.I. Bakhtiyarov, 2006, "Structure and Elemental Distribution in Beilby Layer on the Surface of Fe-Cr-Al-La Alloy", **Journal on Engineering and Technology**, Vol. 1, No. 4, pp. 61-71.
39. E. R. Kutelia, O.O. Tsurtsunia, H. Adanir, S.I. Bakhtiyarov, D. I. Beradze, B.G. Eristavi, 2006, "Investigation of the Depth and the Character of Transformations During Mechanical Polishing of Ground Surface Fe-Cr-Al-La Alloy", **Journal of Georgian Engineering News**, No. 2, pp. 44-54.
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41. S. I. Bakhtiyarov, 2006, "CFD Simulations in Magnesium Fluidized Bed Heat Treatment Process", **AFS Transactions**, Paper No. 06-126.
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43. A. K. Shakhverdiyev, I. E. Mandrik, G. M. Panakhov, E. M. Abbasov and S. I. Bakhtiyarov, 2005, "Efficiency of Viscoelastic Compositions in Complicated Technological Operations", **Journal of Inventions and Developments in Oil and Gas Industry**, No. 6, pp. 55-61 (in Russian).
44. G.M. Panahov, S.I. Bakhtiyarov, E.M. Abbasov, 2005, "Estimation and Regulation of Strengthening Properties of Cross-Linked Polymeric Compositions", **Transactions of Institute of Mathematics and Mechanics of NAS of Azerbaijan, Baku, Elm Publishers**, Vol. 23, pp. 207-214.
45. S. I. Bakhtiyarov, O. T. Inal, B. Guo, R. A. Overfelt, 2005, "A New Image Analysis Method for Shape Prediction of a Levitated Aspherical Droplet", **Journal on Engineering and Technology**, Vol. 1, No. 1, pp. 67-73.
46. S. I. Bakhtiyarov, R. A. Overfelt, M. G. Black and D. J. Weiss, 2005, "Design and V-Process Production of Cast Magnesium Component", **AFS Transactions**, Vol. 113, Paper No. 05-051.

47. S. I. Bakhtiyarov, R. A. Overfelt, J. K. Capps and D. J. Weiss, 2005, "Hot Core Distortion Studies during Magnesium Casting", **AFS Transactions**, Vol. 113, Paper No. 05-050.
48. S. I. Bakhtiyarov, R. A. Overfelt and S. Adanur, 2005, "Improvements in Fabrication of Sand/Binder Cores for Casting", **NASA Tech Briefs**, MFS-31819/20/21.
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50. S. I. Bakhtiyarov, R. A. Overfelt and C. H. Sherwin, 2004, "Discovering Hot Distortion Properties in PUCB Cores", **Modern Casting**, Vol. 94, No. 10, pp. 31-34.
51. S. I. Bakhtiyarov, R. A. Overfelt and S. G. Teodorescu, 2004, "Fraction Solid Measurements on Solidifying Melt", **Journal of Fluids Engineering**, Vol. 126, pp. 193-197.
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56. A. J. Meir, P. G. Schmidt, S. I. Bakhtiyarov and R. A. Overfelt, 2004, "Numerical Simulation of Steady Liquid-Metal Flow in the Presence of a Static Magnetic Field", Transaction of the ASME, **Journal of Applied Mechanics** Vol. 71, pp. 1-10.
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143. D. A. Siginer and S. I. Bakhtiyarov, 1996, "Viscoelastic Fluid Flow in In-Homogeneous Porous Media", **Proceedings, Energy Week'96 Conference and Exhibition: Drilling & Production Economics**, Penn Well Conferences & Exhibitions, Houston, Texas, Vol. 3, pp. 313-317.
144. S. I. Bakhtiyarov and R. A. Overfelt, 1996, "Effect of Slugging Phenomena on Drag Coefficient in Fluidized Beds", **Proceedings, 31st Intersociety Energy Conversion Engineering Conference, Institute of Electrical and Electronics Engineers**, Washington, D. C., Vol. 2, pp. 793-798.
145. S. I. Bakhtiyarov and R. A. Overfelt, 1996, "Study of Channeling Phenomena in Fluidized Foundry Sands", **ASME Proceedings, 31st National Heat Transfer Conference**, V. Prasad et al., ed., ASME, United Engineers Center, Houston, Texas, Vol. 1, pp. 239-245.
146. S. I. Bakhtiyarov and D. A. Siginer, 1995, "Flow of Linear Fluidity Fluids in Eccentric Annuli", **Proceedings, ASME International Mechanical Engineering Congress and Exposition, Developments and Applications of Non-Newtonian Flows**, D. A. Siginer and H. P. Wang, ed., ASME United Engineering Center, San Francisco, CA, FED - Vol. 231/MD-Vol. 66, pp. 135-140.
147. S. I. Bakhtiyarov, 1990, "Magnetized Polymer Solution Flow in Porous Media", **Proceedings, 3rd European Rheology Conference and Golden Jubilee Meeting of British Society of Rheology**, D. R. Oliver, ed., Elsevier Applied Science Publication, Edinburgh, UK, pp. 25-27.
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149. S. I. Bakhtiyarov, 1984, "Rheological Properties of Viscoelastic Systems Used in Pumping and Separation", **Proceedings: Advances in Rheology, 9th International Congress on Rheology**, D. Mena, ed., Acapulco, Mexico, Vol. 2 - Fluids, p. 469.

d) Articles in Professional Magazines

1. F. A. Allahdadi and S. I. Bakhtiyarov, 2011, "Safety of Nuclear Powered Missions, **Space Safety Magazine**, Issue 1, Fall 2011, pp. 24-27.
2. "AFS Magnesium Division Meets in Auburn", **Auburn MEssenger**, Vol. 13, No. 2, 2004, p. 3.
3. "108th Metalcasting Congress Report: Magnesium", **Modern Casting**, Vol. 94, No. 7, 2004, p. 52.
4. "First Magnesium Casting Utilizing Vacuum Sealed Molding Process Produced at Auburn University", **Modern Casting**, Vol. 93, No. 8, 2003, p. 18.
5. "First Magnesium Casting Utilizing V-Process Produced at Auburn University", **Engineered Casting Solutions**, Vol. 5, No. 3, 2003, p. 13.
6. "Magnesium V-Process Casting", **Auburn Messenger**, Vol. 13, No. 1, 2003, p. 10.

PRESENTATIONS AT CONFERENCES AND SYMPOSIA

1. **Summer Scientific Conference. NASA Glenn Research Center**, Cleveland, OH, July 30, 2015:
 - ❖ "Tribological Measurements on Ionic Lubricants for Space Applications"
2. **Space Safety Forum. Kirtland Air Force Base**, Albuquerque, NM, January 7, 2014:
 - ❖ "Modeling Space Debris"
3. **International Scientific Conference Devoted to the 85th Anniversary of Academician A. Kh. Mirzajanzadeh**, Baku, Azerbaijan, November 21-22, 2013:
 - ❖ "Self-Healing Materials: Reality or Myth?"
4. **Seminar presentations at Mevlana University**, Konya, Turkey, September 17-19, 2013:
 - ❖ "Self-Healing Composite Materials"
5. **1st Workshop on Development of a Tool for Aviation Risk Assessment due to Space Debris and Meteoroids**, 45th Space Wing, Patrick Air Force Base, FL, October 9-11, 2013:
 - ❖ "US Air Force safety Center's Expectations"
6. **Safety Design for Space Operations Seminars**, Space safety Center, Kirtland AFB, NM, September - December 2013.
7. **Nuclear and Emerging Technologies for Space 2013 (NETS 2013)**, Albuquerque, NM, February 25-28, 2013:
 - ❖ "A Nanocomposite Material for Space Exploration"(Paper # 6768 submitted)
8. **6th IAASS Conference "Safety is Not an Option"**, Montreal, Canada, May 21-23, 2013:
 - ❖ "A Complex Variable Method to Predict an Aerodynamics of Arbitrary Shape Debris"
9. **44th Lunar and Planetary science Conference**, The Woodlands, TX, March 18-22, 2013:
 - ❖ "Mars Science Laboratory Interagency Nuclear Safety Review Panel: History and Independent Risk Analysis Process" (Abstract No. 1716).

10. **Briefing to Maj General Margaret H. Woodward**, Kirtland AFB, NM, January 8, 2013:
 - ❖ “Mars Science Lab Interagency Nuclear Safety Review Panel”
11. **5th Georgian-German School and Workshop in Basic Science GGSWBS’12**, Tbilisi-Batumi, Republic of Georgia, August 5-18, 2012:
 - ❖ “Mars Science Laboratory Mission: Safety Review”
 - ❖ “Self-Healing Materials: Myth or Reality?”
12. **Third Conference on Early Mars: Geologic, Hydrologic, and Climatic Evolution and the Implications for Life**, Lake Tahoe, Nevada, May 21-25, 2012:
 - ❖ “Controlling Viscous Anomaly in Heterogeneous Carbohydrate Compositions”(Abstract # 7003)
13. **Concepts and Approaches for Mars Exploration**, Houston, TX, June 12-14, 2012:
 - ❖ “High-Temperature Self-Repairing Coating Material for Sample Return Space Capsules (SRSC) for Earth Entry” (Abstract # 4030)
14. **Nuclear and Emerging Technologies for Space**, The Woodlands, TX, March 21-23, 2012:
 - ❖ “A Novel Radiation Shielding Nano-Composite Material for Space Exploration” (Paper # 3018).
15. **Space and Cyber Safety Council**, Kirtland Air Force Base, NM, March 6-8, 2012:
 - ❖ “Interagency Nuclear safety review Panel and Active Debris Removal”
16. **Thermal and Materials Nanoscience and Nanotechnology Conference**, Antalya, Turkey, May 29 – June 3, 2011:
 - ❖ “A Novel Technology of Synthesizing Carbon Nanoparticle Doped with Ferromagnetic Iron Oxide and Clusters of Cobalt Atoms”
17. **The 5th International Association for the Advancement of Space Safety (IAASS) Conference “A Safer Space for a Safer World”**, Versailles, Paris, France, October 17-19, 2011:
 - ❖ “High Temperature Self-Healing Metallic Composite”
 - ❖ “A Novel High Temperature resistant Electromagnetic/Radiation Shielding Material for Space Exploration”
 - ❖ “Modeling the Behavior of Radioactive Materials in Combined-Phenomenology Environments”
18. **BIT’s 2nd Annual World Congress on Well Stimulation & Enhanced Oil Recovery (WSEOR-2011)**, Dalian, China, May 22-25, 2011:
 - ❖ “Multicellular Signaling Mechanism in Microbial Enhanced Oil Recovery”
 - ❖ “A Novel HSGAP EOR Technology”
19. **ASME ES Fuel Cell 2011**
 - ❖ “Computational Investigation of the Aerodynamic Effects of Gurney Flaps and Trailing Edge Devices for HAWT Blades” (paper # 54066)
20. **63rd Annual Meeting of the APS Division of Fluid Dynamics**, Long Beach, California, November 21-23, 2010:
 - ❖ “Thermo-Rheometric Studies of New Class Ionic Liquid Lubricants”

21. **ASME International Mechanical Engineering Congress and Exposition**, Vancouver, BC, Canada, November 12-18, 2010:
 - ❖ “Development of Novel Magnetic Carbon Nanopowders”
 - ❖ “Polymer Adsorption Phenomena in Porous Media Filtration Problems” (accepted)
22. **Annual Meeting, Stripper Well Consortium**, Canandaigua, NY, June 22-24, 2010:
 - ❖ “Pilot Tests of Hybrid System of Gas-Acid-Polymer (HSGAP) New Stimulation Technology to Improve Low Permeable Well-Bore Zone Characteristics and Enhance Oil Recovery in Osage County, OK Stripper Wells”
23. **2010 TMS Annual Meeting & Exhibition, Symposium: Global Innovations in Manufacturing of Aerospace Materials: The 11th MPMD Global Innovations Symposium**, Seattle, WA, February 14-18, 2010:
 - ❖ "A Self-healing Metal/Metal/Ceramic High Temperature Coating Systems for Aerospace Structures"
24. **NACE Corrosion 2010 International Conference and Expo**, San Antonio, TX, March 14-18, 2010:
 - ❖ “Relatively Simple and Low Cost Technique of New Metal-Ceramic Medical Implants on the Basis of Fe-Cr-Al-RE Alloy”
25. **2009 New Mexico Water Research Symposium**, Socorro, NM, August 10-11, 2009:
 - ❖ “A Beneficial Effect of Polydisperse Nanoparticles on Membrane Desalination”
26. **ASME International Mechanical Engineering Congress and Exposition**, Lake Buena Vista, FL, November 13-19, 2009:
 - ❖ “Rheological Studies on Viscoelastic Nanolubricants”
27. **ASME Fluids Engineering Division Summer Meeting, Symposium on Transport Phenomena in Manufacturing Processes**, Vail, CO, August 2-5, 2009:
 - ❖ “High-Temperature Self-Healing Metallic Coating: Concepts and First Results”
 - ❖ “Core Flood Tests of In-Situ CO₂ Generation Technology”
 - ❖ “Polymer Adsorption Phenomena in Porous Media Filtration Problems”
 - ❖ “Rheological Studies of Lubricants with Nanocarbon Additives”
28. **Gordon Research Conference on High Temperature Corrosion**, Colby Sawyer College, New London, NH, USA, July 26-31, 2009:
 - ❖ “The Overview of Up to Date Investigation Results of High Chromium Fe-Cr-Al-La Alloy”
29. **ACI’s Optimizing EOR Strategy Summit**, London, UK, March 11-12, 2009:
 - ❖ “EOR Game Changer: In-Situ CO₂ Generation Technology” (invited speaker)
30. **NACE Corrosion 2009 Conference**, Atlanta, GA, March 22-26, 2009:

- ❖ “Development of High-Temperature Corrosion and Creep Resistant Nb, Mo and Cr-Based Compositions with Protective Self-Healing Coating of Fe-45%Cr-4%Al-1%Ni-0.3%La Alloy” (Paper # 09272)
31. **ASME International Mechanical Engineering Congress and Exposition, Boston, MA**, October 31 - November 6, 2008:
 - ❖ “A Novel Self-Healing Materials Concept”
 32. **17th International Corrosion Congress**, Las Vegas, NV, October 6-10, 2008:
 - ❖ “On the Role of Entropy-Excited Surface Layers in the Formation of High Temperature Corrosion Resistant Barrier Oxide Scale on Fe-Cr-Al-La Alloy”
 33. **ASME Fluids Engineering Division Summer Conference**, Jacksonville, FL, August 10-14, 2008
 - ❖ “On Negative Pressure Waves in Geological and Geophysical Processes”
 - ❖ “Foam Stability in In-Situ CO₂ Enhanced Oil Recovery Technology”
 34. **2008 New Mexico Water Research Symposium**, Socorro, NM, August 12, 2008:
 - ❖ “A Beneficial Effect of Polydisperse Nanoparticles on Membrane Desalination”
 35. **Canadian Institute’s Enhanced Oil Recovery Conference**, Calgary, Alberta, Canada, April 30 – May 2, 2008:
 - ❖ “In-Situ CO₂ Flood Technology”
 36. **Petroleum Short Course**, Petroleum Industry of West Texas & Texas Tech University, Lubbock, TX, April 21-24, 2008
 - ❖ “A New Technology to Prevent VOC Emissions in Tank Batteries”
 37. **Corrosion 2008 NACE International Conference & Expo**, New Orleans. LA, March 16-20, 2008
 - ❖ “New Deformable Austempered Ductile Irons (DADI) as an Efficient Material for Substitution of Critical Parts of oil Well Equipment”
 38. **7th Scientific and Practical Conference “Geology and Development of Oilfields with Hard to Recover Reserves”**, Gelsenjik, Russia, September 25-27, 2007:
 - ❖ “Novel Rheogazochemical Technologies of Enhanced Oil Recovery”
 39. **19th Annual Rio Grande Symposium on Advanced Materials**, Albuquerque, NM, October 9, 2007:
 - ❖ “Concentration Polarization Effects in Membrane Technology”
 - ❖ “Slim Tube Studies of New CO₂ Enhanced Oil Recovery Technology”
 40. **6th Symposium on Transport Phenomena in Manufacturing Processes, 5th Joint 2007 ASME/JSME Fluids Engineering Summer Meeting**, San Diego, CA, July 30-August 2, 2007:
 - ❖ “Polymer/Surfactant Effects on Generated Volume and Pressure of CO₂ in EOR Technology”

- ❖ “Energy Saving Technology Based on Negative Pressure Phenomenon”
- 41. **The International Conference BALTRIB 2007**, Kaunas, Lithuania, November 21-23, 2007:
 - ❖ “Investigation of Beilby Layer and Its Role in the Formation of Functional Surfaces on Fe-Cr-Al-La Alloys”
- 42. **54th Southwestern Petroleum Short Course**, Lubbock, TX, April 25-26, 2007:
 - ❖ “A Novel Enhanced Oil Recovery Technology: In-Situ CO₂ Generation”
- 43. **SPE Production and Operation Symposium, Oklahoma City, OK, March 31 – April 3, 2007:**
 - ❖ “Effect of Surfactant on Volume and Pressure of Generated CO₂ Gas”
- 44. **2nd Conference of Center for Energetic Materials and Energetic Devices (CEMED), Socorro, NM, February 27, 2006:**
 - ❖ “Explosives Engineering Program at New Mexico Tech: Past, Present and Future” (featured speaker)
- 45. **SAMSON Technical Meeting, Midland, TX, February 21, 2007:**
 - ❖ “In-Situ CO₂ Generation Technology”
- 46. **Trans-Pecos SPE Meeting, Odessa, TX, November 14, 2006:**
 - ❖ “Reenergizing Reservoir”
- 47. **International Metallurgical and Materials Congress, Turkey, October 9-11, 2006:**
 - ❖ “Thermo-Mechanical and Isothermal Treatments Influence on the Wear of ADI during Dry Friction”
- 48. **Engineers’ Society of Tulsa, Tulsa, OK, October 2, 2006:**
 - ❖ “Directing Unrecovered Oil to a Desired Destiny”
- 49. **6th International Scientific Practical Conference XAZARNEFTGASYATAG-2006, Baku, Azerbaijan, October 12-14, 2006:**
 - ❖ “Experimental Study of Salinity Effect on CO₂ Flood”
- 50. **SPE Enhanced Oil Recovery Forum, Broomfield, CO, June 25-30, 2006:**
 - ❖ “Enhanced Oil Recovery by In-Situ Generated CO₂ Gas: Volume and Pressure Measurements”
- 51. **12th International Conference on Mathematics and Mechanics, Baku, Azerbaijan, June 2006:**
 - ❖ “Kinetics of Gas-Generation Processes in Liquid Solutions”
- 52. **13th International Metallurgy-Materials Congress (IMMC 2006), Istanbul, Turkey, November 9-11, 2006:**

- ❖ “Thermo-Mechanical and Isothermal Treatments Influence on the Wear of ADI during Dry Friction”
53. **ASME Joint U.S.-European Fluids Engineering Summer Meeting, Miami, FL, July 17-20, 2006:**
 - ❖ “Oil Recovery by In-Situ Gas Generation: Volume and Pressure Measurements”
 54. **”, JuniorEuromat 2006, Lausanne, Switzerland, September 4-8, 2006:**
 - ❖ “Structure and Elemental Distribution in Beilby Layer on the Surface of Fe-Cr-Al Alloy”
 55. **ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, November 5-10, 2006:**
 - ❖ “The Effect of Salinity on In-Situ Generated CO₂ Gas: Simulations and Experiments”
 - ❖ “In-Situ Carbon Dioxide Generation for Oil Recovery: Experimental Study of Pressure and Temperature Variations during Stoichiometric Reaction”
 56. **International Conference on Plasma Surface Engineering, Proceedings, Garmish, Germany, September 10-15, 2006:**
 - ❖ "Obtaining the Self-Organizing Thin Protective Thermal-Barrier and Tribological Coatings on the Surface of Fe-44%Cr-4%Al-0.3%La Alloy"
 57. **9th International Fatigue Congress, Atlanta, GA, May 14-19, 2006:**
 - ❖ “Effect of High-Temperature Thermo-Mechanical Treatments and Multistep Austempering Processes on LCF of ADI”
 58. **XVII Congress of South American Electrochemical Society (SIBAE), La Plata, Argentina, April 3-7, 2006:**
 - ❖ “Electrochemical Characterization Study of Corrosion of Magnesium Based Alloy AZ91E Obtained by Addition of Nucleants under Induction Magnetic Field”
 59. **110th Metalcasting Congress and CastExpo, Columbus, OH, April 18-21, 2006:**
 - ❖ “CFD Simulations in Magnesium Fluidized Bed Heat Treatment Process”, Paper No. 06-126
 60. **TMS Annual Meeting and Exhibition, San Antonio, TX, March 13-16, 2006:**
 - ❖ “Numerical Simulations of Radiative Heat Transfer between Electronic Devices and Fluidized Nanobed”
 61. **23rd Heat Treating Society Conference and Exposition, Pittsburgh, PA, September 25-28, 2005:**
 - ❖ “Radiative Heat Transfer Simulations in Fluidized Bed Heat Treatment Process”
 62. **3rd Eurographics Symposium on Geometry Processing in Cooperation with ACM SIGGRAPH, Vienna, Austria, July 4-6, 2005:**
 - ❖ “A Shape Prediction of Electromagnetically Levitated Liquid Metal Droplet”

63. **ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5-11, 2005:**
- ❖ “Rheological Measurements on Viscoelastic Nanolubricants”
 - ❖ “Degradation Phenomena in Viscoelastic Composites Used in Oil Industry”
64. **ASME Fluids Engineering Summer Conference, Houston, TX, June 19-23, 2005:**
- ❖ “Synergistic Effects of Self-Recovering Viscoelastic Tribological Nanosystems”
 - ❖ “Rheological Property Measurements on Viscoelastic Tribological Nanosystems”
 - ❖ “Rheological Measurements on Viscoelastic Self-Healing Composites Used in Oil Industry”
65. **3rd International Conference on Computational Methods in Multiphase Flow, Portland, Maine, October 31 – November 2, 2005:**
- ❖ “Numerical Simulations of Radiative Heat Transfer in Fluidized Bed Heat Treatment Process”
66. **International Conference on Mathematics and Mechanics, Baku, Azerbaijan, May 11-13, 2005:**
- ❖ “Estimation and Regulation of Strength Properties of Cross-Linked Polymer Compositions”.
67. **28th International Thermal Conductivity Conference and 16th International Thermal Expansion Symposium, New Brunswick, Canada, June 26-29, 2005:**
- ❖ “Electrical and Thermal Conductivity of Fiber Reinforced Aluminum Alloy A356”
 - ❖ “Thermal Expansion Measurements on Fiber Reinforced Sand Core Composites”
 - ❖ “Thermal Expansion Measurements on Molten Metals: Shape Recovery of Electromagnetically Levitated Aspherical Droplet”
68. **109th Metalcasting Congress and CastExpo, St. Louis, MO, April 16-19, 2005:**
- ❖ “Hot Core Distortion Studies during Magnesium Casting” (Paper No. 05-050)
 - ❖ “Design and V-Process Production of Cast Magnesium Component” (Paper No. 05-051)
69. **TMS Annual Meeting and Exhibition, San Francisco, CA, February 13-17, 2005:**
- ❖ “Rheological Characterization of Viscoelastic Composite Systems Used in Oil Industry”
 - ❖ “Numerical Simulations and Experimental Study of Hot Core Distortion Phenomenon in Magnesium Casting”
 - ❖ “Numerical Simulations of Radiative Heat Transfer between High-Temperature Fluidized Beds and Magnesium Castings”
70. **6th International Symposium on MEMS and Nanotechnology, SEM Annual Conference and Exposition on Experimental and Applied Mechanics, Portland, OR, June 7-9, 2005:**
- ❖ “Heat Transfer Studies on Nanofluids under Turbulent Flow Conditions”
 - ❖ “Rheological Characterization of Nanofluids”

71. **International Conference on Transport Phenomena in Micro and Nanodevices, Kona Coast, HA, October 17-21, 2004:**
 - ❖ “Numerical Simulations of Flow Phenomena in Fluidic Pumps”
72. **ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 14-19, 2004:**
 - ❖ “Magnesium V-Process Casting. Part I: CFD Simulations and Experimental Casting”
 - ❖ “Magnesium V-Process Casting. Part II: Electrochemical and SEM Analyses for Corrosion Testing”
73. **TMS Annual Meeting and Exhibition, Charlotte, NC, March 14-18, 2004:**
 - ❖ “First Magnesium V-Process Casting”
 - ❖ “Vacuum-Sealed Aluminum Step Casting”
74. **ASME Heat Transfer/Fluids Engineering Summer Conference, Charlotte, NC, July 11-15, 2004:**
 - ❖ “Numerical Simulations and Experimental Study of Hot Core Distortion Phenomenon in Aluminum Casting”
 - ❖ “Rheological Flows in Channels with Complex Geometry and Porous Medium”
75. **108th Metalcasting Congress, Rosemont, IL, June 12-15, 2004:**
 - ❖ “Hot Distortion Studies in Phenolic Urethane Cold Box System” (Paper No. 04-027)
 - ❖ “First V-Process Casting of Magnesium” (Paper No. 04-028)
76. **27th International Thermal Conductivity Conference and 15th International Thermal Expansion Symposium, Knoxville, TN, October 26-29, 2003:**
 - ❖ “Electrical Conductivity Measurements on Light Metal Alloys”
 - ❖ “Thermophysical Bulk Properties of Mold Materials”
 - ❖ “Future Needs and Opportunities in Thermophysics from Materials Engineer’s Perspective”
77. **International Symposium on Physical Science in Space: Spacebound, Toronto, Canada, May 23-27, 2004:**
 - ❖ “Thermophysical Properties Measurements Using Electromagnetic Levitation under Microgravity: Electrical Resistivity”
 - ❖ “Thermophysical Properties Measurements Using Electromagnetic Levitation under Microgravity: Thermal Expansion and Mass Density”
78. **ASME International Mechanical Engineering Congress and Exposition, Washington, DC, November 16-21, 2003:**
 - ❖ “CFD Simulation of Fluid Flow Through Porous Media: Application to Decomposed Gases Flow Through Foam Pattern in Lost Foam Casting”

- ❖ “Numerical Simulation and Experimental Study of Suspension Flow with Deposition in Porous Media: Application to Sand Core Coating in Metalcasting Industry”
 - ❖ “Volume Computation of a Levitated Aspherical Droplet from 2-D Image Information”
79. **Auburn Manufacturing Advisory Board Meeting, Auburn, Alabama, September 12, 2003:**
- ❖ “Effect of Sand and Core Shooting Parameters on Core Distortion in Aluminum Casting”
80. **4th ASME/JSME Joint Fluids Engineering Conference, Honolulu, Hawaii, July 6-10, 2003:**
- ❖ “Numerical Simulation and Experimental Study of Gas Flow Dynamics in Porous Media: Application in Cold Box Foundry Process”
 - ❖ “Computer Modeling and Experimental Verification of Mold Filling in Counter-Gravity Lost Foam Casting Process”
81. **107th AFS Casting Congress, Milwaukee, WI, April 26-29, 2003:**
- ❖ “Electrical Resistivity and Thermal Conductivity of Magnesium Alloy AZ91E by Contactless Measurement Technique”
 - ❖ “Numerical Simulations and Experimental Study of Gassing Cycle in Cold Box Sand Coremaking Process”
82. **3rd International Symposium on Food Rheology and Structure, Zurich, Switzerland, February 9-13, 2003:**
- ❖ “Bubble Formation Technique to Detect Bacteriologically Contaminated Foods”
 - ❖ “Capacitive Technique for Bacteria Prediction in Contaminated Food”
83. **15th Symposium on Thermophysical Properties, Boulder, CO, June 22-27, 2003:**
- ❖ “Thermophysical Property Measurements on Mold Materials”
84. **TMS (The Minerals, Metals & Materials Society) Conference: Magnesium Technology, March, 2003:**
- ❖ “Vacuum-Sealed Molding Process for Magnesium Casting: Numerical Simulations and Design of Experiments”
 - ❖ “Electrical and Thermal Conductivity Measurements on Commercial Magnesium Alloys”
85. **ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, November 17-22, 2002:**
- ❖ “Parametric Study of Mold Filling Process in Lost Foam Casting Dynamic Simulation”
 - ❖ “Stability of Mushy State in Magnetic Field During Electrical Conductivity Measurements Using Rotational Technique”

- ❖ “Liquid Metal Stream Junction Defects in Aluminum Lost Foam Casting”
 - ❖ “Cooling Rate Studies in Aluminum Counter Gravity Lost Foam Casting”
 - ❖ “Numerical Simulation and Thermometric measurements on Mold Filling Dynamics in Lost Foam Casting”
 - ❖ “Fraction Solid Measurements on A319 Aluminum Alloy”
 - ❖ “Dynamic Analysis of Airflow in Air-Jet Filling Insertion. Part I: Air Pressure Measurements”
 - ❖ “Dynamic Analysis of Airflow in Air-Jet Filling Insertion. Part II: Air Velocity Measurements”
- 86. ASME Joint US-European Fluids Engineering Conference, Montreal, Quebec, Canada, July 14-18, 2002:**
- ❖ “Fluid Flow Effect in Electrical Conductivity Measurements of Molten Metals by Inductive Technique”
 - ❖ “Numerical Simulation and Experimental Study of Heat and Mass Transfer Phenomena in Vacuum-Sealed Casting Process”
 - ❖ “CFD Simulations and Experimental Study of Two-Phase Flow in Sand Coremaking Process”
- 87. AFS Advanced Lost Foam Casting Technology Conference, Chicago, IL, June 20, 2002:**
- ❖ “Counter Gravity Lost Foam Casting”
- 88. 106th AFS Casting Congress, Kansas City, MO, May 4-7, 2002:**
- ❖ “Electrical Resistivity and Thermal Conductivity of Magnesium Alloy AE42”
 - ❖ “Experimental and Numerical Study of Bonded Sand/Air Two-Phase Flow in PUA Process”
 - ❖ “Thermophysical Properties of 201 Aluminum, Ductile Iron, and Sebiloy II”
- 89. ASME International Mechanical Engineering Congress and Exposition, New York, NY, November 11-16, 2001:**
- ❖ “Numerical Simulations of Fluid Flow During Electromagnetic Stirring of Metals”
 - ❖ “Numerical Study of Mold Filling Dynamics in “Cold-Box” Sand Coremaking Process”
 - ❖ “CFD Modeling of Metal Casting Process in Vacuum-Sealed Step Molding”
 - ❖ “CFD Simulations of Flow Dynamics in Porous Media of Variable Permeability Arranged in Series”
 - ❖ “Numerical Simulation of Molten Metal-Polymeric Foam Interface Velocity During Lost Foam Casting”
 - ❖ “Decomposed EPS Gases Pressure Measurements in Iron Lost Foam Casting Process”
 - ❖ “Experimental Study of EPS Decomposition in Lost Foam Casting Process”

- ❖ “Effect of Polymer Additive on the Synthetic Jet Bifurcation”
90. **Microgravity Transport Processes in Fluid, Thermal, Biological and Materials Sciences II, Banff, Alberta, Canada, September 30 – October 5, 2001:**
- ❖ “Electromagnetic Levitation Melting Technique: History and Future (Thermophysical Properties Measurements under Microgravity Conditions)”
91. **105th AFS Casting Congress, Dallas, TX, April 28-May 1, 2001:**
- ❖ “Experimental and Numerical Study of Sand Core Molding Process”
 - ❖ “Measurements of Decomposed EPS Gases Pressure and Molten Metal-Polymeric Foam Interface Velocity During Counter Gravity Lost Foam Casting”
92. **ASME International Mechanical Engineering Congress and Exposition, Orlando, FL, November 5-10, 2000:**
- ❖ “Experimental Study of Multiphase Flow in Cold Box Core Process”
 - ❖ “Measurements of Decomposed EPS Gases Pressure and Molten Metal-Polymeric Foam Interface Velocity During Lost Foam Casting Process (Part I: Disconnect Casting)”
 - ❖ “Measurements of Decomposed EPS Gases Pressure and Molten Metal-Polymeric Foam Interface Velocity During Lost Foam Casting Process (Part II: Rectangular Bars Casting)”
93. **14th Symposium on Thermophysical Properties, Boulder, CO, June 25-30, 2000:**
- ❖ “Contactless Inductive Technique for Electrical Conductivity Measurements on Molten Metals”
 - ❖ “Thermoviscoelastic Properties of Phenolic Resin/Polymeric Isocyanate Binders System”
94. **ASME Fluids Engineering Division Summer Meeting, Boston, MA, June 11-15, 2000:**
- ❖ “Polymeric Foam – Liquid Metal Interface Dynamics in Vacuum Assisted Counter Gravity Casting”
 - ❖ “Advanced Technique in Vacuum Assisted Counter Gravity Lost Foam Casting Process”
95. **20th Southeastern Conference on Theoretical and Applied Mechanics, Pine Mountain, GA, April 16-18, 2000:**
- ❖ “Local Velocity Measurements in Liquid Metals by Permanent Magnet Potential Probe”
 - ❖ “Study of Molten Metal-Polymer Foam Interface Dynamics in Counter Gravity Casting”
 - ❖ “Advances in Counter Gravity Lost Foam Casting Process”
96. **104th AFS Casting Congress, Pittsburgh, PA, April 8-11, 2000:**
- ❖ “Advances in Counter Gravity Lost Foam Casting Process”

- ❖ “Thermophysical Properties of A356 Aluminum, Class 40 Gray Iron, and CF8M Stainless Steel”
97. **National Textile Center Annual Forum, Myrtle Beach, SC, 2000:**
- ❖ “Characterization of Air-Yarn Interface in Air-Jet Weaving”
98. **ASME International Mechanical Engineering Congress and Exposition, Nashville, TN, November, 1999:**
- ❖ “Rheological Measurements on Molten Metals”
 - ❖ “Velocity, Potential, and Temperature Distributions in Molten Metals During Electromagnetic Stirring. Part I: Experimental Measurements”
 - ❖ “Velocity, Potential, and Temperature Distributions in Molten Metals During Electromagnetic Stirring. Part II: Numerical Simulations”
99. **Second International Symposium on Mathematical and Computational Applications, Baku, Azerbaijan, September 1-3, 1999:**
- ❖ “Air-Flow over Wavy Yarn in Air-Jet Filling Insertion”
 - ❖ “Numerical Study of Collision Efficiency of Dust Particles”
100. **3rd ASME/JSME Joint Fluids Engineering Conference and FED Summer Meeting, San Francisco, CA, July 18-22, 1999:**
- ❖ “Rotational Technique for Liquid Metals Viscosity Measurements”
 - ❖ “Rheological Properties of Refractory Coating Materials”
101. **103rd AFS Casting Congress & CastExpo’99, St. Louis, MO, March 13-16, 1999:**
- ❖ “Rheology of Refractory Coating Materials Used in Lost Foam Casting Process”
102. **Space Technology & Applications International Forum, Conference on Applications of Thermophysics in Microgravity & Breakthrough Propulsion Physics, Albuquerque, NM, January 31 – February 4, 1999:**
- ❖ “Rheological Measurements in Reduced Gravity”
103. **34th Intersociety Energy Conversion Engineering Conference, Vancouver, Canada, August 1-5, 1999:**
- ❖ “Simultaneous Measurements of Local Velocities and Temperature in Liquid Metals by Permanent-Magnet Potential Probe”, Paper # 1999-01-2508.
104. **Materials and Crystal Growth Seminar at NASA Marshall Space Flight Center, Huntsville, AL, October 9, 1998:**
- ❖ “Recent Advances in Hydrodynamics of Fluidized Beds”
105. **3rd International Conference on Multiphase Flow, Lyon, France, June 8-12, 1998:**
- ❖ “Apparent Viscosity Model for Radial Segregated Fluidized Beds”

106. **ASME Fluids Engineering Division Summer Meeting, Washington D.C., June 21-25, 1998:**
- ❖ “Experimental Study of Hydrodynamical and Rheological Properties of Two-Phase Solid-Gas Systems”
107. **ASME International Mechanical Engineering Congress and Exposition, Anaheim, CA, November 15-20, 1998:**
- ❖ “Rheology of Suspensions in Reduced Gravity”
 - ❖ “Interfacial Velocity in the Core-Annular Flow in a Tube”
 - ❖ “A Rheological Characterization of High Percent Solids Kraft Black Liquor”
108. **International Symposium on Liquid-Liquid Two-Phase Flow and Transport Phenomena, Antalya, Turkey, November 3-7, 1997:**
- ❖ “On the Laminar Core-Annular Flow of Two Immiscible Fluids in a Horizontal Tube”
109. **ASME Fluids Engineering Division Summer Meeting, Vancouver, B. C., June 22-27, 1997:**
- ❖ “A Rheological Model of Gas-Particle Systems in Poiseuille Flow”
110. **68th Annual Meeting of The Society of Rheology, Galveston, Texas, 1997:**
- ❖ “Displacement Process of One Fluid by Another in a Straight Tube”
111. **12th International Congress on Rheology, Quebec City (Quebec), Canada, 1996:**
- ❖ “Novel Effects in the Flow of Viscoelastic Fluids in Non-Homogeneous Porous Media”
112. **ASME International Mechanical Engineering Congress and Exposition, Atlanta, GA, 1996:**
- ❖ “Study of the Apparent Viscosity of Fluidized Sand”
 - ❖ “Displacement of a Fluid by Another in Tubes”
113. **Energy Week’96 Conference and Exhibition: Drilling & Production Economics, Houston, Texas, 1996:**
- ❖ “Viscoelastic Fluid Flow in In-Homogeneous Porous Media”
114. **31st Intersociety Energy Conversion Engineering Conference, Washington, D. C., 1996:**
- ❖ “Effect of Slugging Phenomena on Drag Coefficient in Fluidized Beds”
115. **31st National Heat Transfer Conference, Houston, Texas, 1996:**
- ❖ “Study of Channeling Phenomena in Fluidized Foundry Sands”
116. **10th Alabama Materials Research Conference, Auburn, AL, 1996:**
- ❖ “Study of Fluidized Sand Viscosity”

117. **Hi-Tech Textiles Exhibition and Conference, Greenville, SC, 1995:**
 - ❖ “Initial Design of Nonwoven Fabrics for Air Filtration”
118. **ASME International Mechanical Engineering Congress and Exposition, San Francisco, CA, 1995:**
 - ❖ “Flow of Linear Fluidity Fluids in Eccentric Annuli”
119. **100th AFS Casting Congress & CastExpo, Philadelphia, PA, 1995:**
 - ❖ “Study of Cohesive Flow in Fluidized Foundry Sands”
120. **International Conference on Mechanics of Drilling Technology, Grozny, USSR, 1991:**
 - ❖ “Heat and Mass Transfer Phenomena of Fracturing Process in Oil Wells”
121. **3rd European Rheology Conference and Golden Jubilee Meeting of British Society of Rheology, Edinburgh, UK, 1990:**
 - ❖ “Magnetized Polymer Solution Flow in Porous Media”
122. **International Conference on Relaxation Phenomena and Properties of Polymers, Voronej, USSR, 1990:**
 - ❖ “Heat Transfer in Laminar Flow Displacement of Newtonian Fluid by Non-Newtonian One”
123. **National Scientific Conference on Mathematical Modeling of Polymer Processing Technology at High Pressures, Perm, USSR, 1990:**
 - ❖ “Measurements of Relaxation Time for Dilute Polymer Solutions”
124. **The Forum on Non-Newtonian Systems in Oil Production, Ufa, USSR, 1989:**
 - ❖ “Power Law Fluid Flow in Porous Medium”
125. **2nd Scientific Conference on Rheology and Optimization of Polymer Processing, Izhevsk, USSR, 1989:**
 - ❖ “Heat and Mass Transfer in Polymer Extrusion”
126. **2nd Conference of European Rheologists, Prague, Czechoslovakia, 1986:**
 - ❖ “The Flow of Viscoelastic Fluids in Channel with Cavity”
127. **4th National Conference on Mechanics of Anomalous Systems, Baku, USSR, 1986:**
 - ❖ “Drag Reduction by Polymer Additives in Circular Tubes”
128. **4th National Conference on Contact Hydrodynamics, Samara, USSR, 1986:**
 - ❖ “Rotational Viscometry under Presence of Apparent Wall Slip”
129. **National Seminar on Modern Problems of Fluid and Gas Mechanics, Grozny, USSR, 1986:**
 - ❖ “Heat and Mass Transfer in Eddy Flows of Viscoelastic Fluids”

130. **National Conference on Processes and Apparatus of Manufacturing of Polymer Materials, Moscow, USSR, 1986:**
 - ❖ “Non-Stable Flow of Polyacrylamide Solutions”
131. **3rd National Conference on Theory of Mechanical Processing of Polymer Materials, Perm, USSR, 1985:**
 - ❖ “Dilute Polyacrylamide Solutions Flow in Cavities”
132. **National Conference on Wear of Mechanics and Protection Methods, Bryansk, USSR, 1985:**
 - ❖ “Load Bearing by Viscoelastic Lubricants”
133. **9th International Congress on Rheology, Acapulco, Mexico, 1984:**
 - ❖ “Rheological Properties of Viscoelastic Systems Used in Pumping and Separation”
134. **13th National Conference on Rheology, Volgograd, USSR, 1984:**
 - ❖ “Degradation Phenomena in Spacer Fluids”
135. **The Forum of Universities of Caucasian Republics on Theoretical Mechanics, Baku, USSR, 1984:**
 - ❖ “Specific Problems of Thermo-Kinetics”
136. **International Workshop on Rheology of Oil, London, UK, 1983:**
 - ❖ “A Study of Viscoelastic Spacer Fluid Flow in Rectangular Channels”
137. **1st Conference of European Rheologists, Graz, Austria, 1982:**
 - ❖ “Enhanced Load Bearing by Polymer Solutions Lubricating External Near-Contact of Sliding Cylinders”
138. **National Forum on Non-Newtonian Systems in Technological Processes of Oil Production, Ukhta, USSR, 1981:**
 - ❖ “Modified Sucker Pump for Oil Production”
139. **7th National Scientific Conference on Hydraulics of Drilling Fluids, Baku, USSR, 1980:**
 - ❖ “Viscoelastic Fluids Flow Study by Photometry Method”
140. **10th National Conference on Rheology, Perm, USSR, 1978:**
 - ❖ “Spacer Fluids in Cementing of Oil Wells”
141. **2nd National Conference on Mechanics of Anomalous Systems, Baku, USSR, 1977:**
 - ❖ “Linear Model for Spacer Fluid Flow”
142. **The Forum of Rheology: Polymers and Oil, Novosibirsk, USSR, 1977:**
 - ❖ “Kinetics of Fluid Displacement from Cavities”

143. **Annual Meeting of Thermophysics Institute, Novosibirsk, USSR, 1976:**
❖ “Experimental Investigation of Newtonian Fluid Flow in Cavities”

REVIEW OF BOOKS, JOURNAL ARTICLES AND CONFERENCE PAPERS

Reviewed Textbooks:

- ❖ D. A. Siginer, 2013, “**Heat Transfer with Non-Newtonian Fluids and Non-Colloidal Suspensions in Conduits and Enclosures**” (New Book Proposal), John Wiley & Sons Limited, Chichester, UK
- ❖ C. T. Crowe, D. F. Elger and J. A. Roberson, 2010, “**Engineering Fluid Mechanics**”, 9th edition, John Wiley & Sons, Inc., NJ
- ❖ C. J. McMahon, 2004, “**Structural Materials**”, Merion
- ❖ A. K. Haghi, 2007, “**Foundations of Heat and Mass Transport in Textiles**”, WSEAS, Greece
- ❖ J. H. Swisher, 2004, “**Materials Processing**”, ASME Press, New York, NY
- ❖ W. D. Callister, 2004, “**Materials Science and Engineering: An Introduction**”, 6th edition, John Wiley & Sons, Inc., NJ
- ❖ B. R. Munson, D. F. Young and T. H. Okiishi, 2004, “**Fundamentals of Fluid Mechanics**”, 5th edition, John Wiley & Sons, Inc., NJ
- ❖ E. M. Abbasov, 1993, “**Thermophysics and Rheodynamics**”, Elm Publishing Company, Baku, Azerbaijan
- ❖ R. Melikov, 1992, “**Environmental Fluid Mechanics for Chemical Engineers**”, Maarif Publishing Company, Baku, USSR
- ❖ R. S. Gurbanov and Z. G. Kerimov, 1991, “**Mechatronics**”, Elm Publishing Company, Baku, USSR
- ❖ A. I. Mamedov, 1990, “**Mechanics for Chemical Engineers**”, Elm Publishing Company, Baku, USSR

Edited

- ❖ “**Rheology and Fluid Mechanics of Nonlinear Materials**”, Proceedings of Symposium at ASME International Mechanical Engineering Congress and Exposition, New Orleans, LA, 2002.
- ❖ “**Rheology and Fluid Mechanics of Nonlinear Materials**”, Proceedings of Symposium at ASME International Mechanical Engineering Congress and Exposition, FED - Vol. 254, New York, NY, 2001.

Reviewed Papers Submitted to Peer-Reviewed Journals:

- ❖ ***AFS Transactions***
- ❖ ***AIChE Journal***
- ❖ ***Biomass & Bioenergy***
- ❖ ***Electrical and Electronics Engineering: An International Journal (EEEIJ)***
- ❖ ***International Journal of Aerospace Engineering (IJAE)***
- ❖ ***International Journal for Communication of Research***

- ❖ *International Journal of Cast Metals Research*
- ❖ *International Journal of Materials and Product Technology (UK)*
- ❖ *International Journal of Recent Advances in Mechanical Engineering (IJMECH)*
- ❖ *International Journal of Thermophysics*
- ❖ *Journal of Applied Mechanics*
- ❖ *Journal of Chemistry*
- ❖ *Journal of Elastomers and Plastics*
- ❖ *Journal of Fluids Engineering*
- ❖ *Journal of Heat and Mass Transfer*
- ❖ *Journal of Materials Science*
- ❖ *Journal of Materials Science and Engineering A*
- ❖ *Journal of Mechanical Engineering Science (JMES) Part C*
- ❖ *Journal of Micromechanics and Microengineering*
- ❖ *Journal of Non-Newtonian Fluid Mechanics*
- ❖ *Journal of Oil and Gas (Russia)*
- ❖ *Journal of Physics (Turkey)*
- ❖ *Journal of Surface and Coatings Technology (Elsevier Publications)*
- ❖ *Maejo International Journal of Science and Technology (Thailand)*
- ❖ *Mathematical and Computer Modeling*
- ❖ *Measurement Science and Technology (UK)*
- ❖ *Metallurgical and Materials Transactions B*
- ❖ *Proceedings of the National Academy of Sciences of Azerbaijan (Science: Physics and Mathematics series)(Azerbaijan)*
- ❖ *Rheologica Acta (Netherlands)*
- ❖ *WSEAS Transactions on Environment and Development (Greece)*

Reviewed Papers Submitted for Presentation at Conferences and Symposia:

- ❖ *ASME International Mechanical Engineering Congress and Exposition, “The 21st Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, 2015, Houston, TX*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, “The 19th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, 2013, San Diego, CA*
- ❖ *International Conference on Mechanical Engineering (MECHE-2013), 2013, Dubai, UAE.*
- ❖ *“The First International Conference on Recent Trends in Mechanical Engineering (RTME2013)”, 2013, Dubai, UAE*
- ❖ *6th IAASS Conference “Safety is Not an Option”, 2013, Montreal, Canada*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, “The 19th Symposium on Fluid Mechanics and Rheology of Nonlinear Materials and Complex Fluids”, 2012, Houston, TX*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, “The 13th Symposium on Advances in Materials Processing Science and Manufacturing”, 2012, Houston, TX*

- ❖ *“Symposium on Transport Phenomena in Manufacturing Processes”, ASME Fluids Engineering Division Summer Meeting, 2012, Puerto Rico, USA*
- ❖ *The 5th International Association for the Advancement of Space Safety (IAASS) Conference “A Safer Space for a Safer World”, 2011, Versailles, Paris, France*
- ❖ *4th World Scientific and Engineering Academy and Society International Conference on Materials Science, 2011, Angers, France*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2010, Vancouver, BC, Canada*
- ❖ *ASME 3rd Joint US-European Fluids Engineering Summer Meeting and 8th International Conference on Nanochannels, Microchannels and Minichannels, 2010, Montreal, Canada*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2009, Lake Buena Vista, FL*
- ❖ *ASME Fluids Engineering Division Summer Conference, 2009, Vail, CO*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2008, Boston, MA*
- ❖ *ASME Fluids Engineering Division Summer Conference, 2008, Jacksonville, FL*
- ❖ *American Conference on Applied Mathematics (MATH’08) and Management, Marketing and Finance (MMF’08), 2008, Cambridge, MA*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2007, Seattle, WA*
- ❖ *5th IASME / WSEAS International Conference on HEAT TRANSFER, THERMAL ENGINEERING and ENVIRONMENT (HTE’07), 2007, Vouliagmeni, Athens, Greece*
- ❖ *5th Joint ASME/JSME Fluids Engineering Conference, 2007, San Diego, CA*
- ❖ *ASME Joint U.S.-European Fluids Engineering Summer Meeting, 2006, Miami, FL.*
- ❖ *AFS 109th Metalcasting Congress and Exposition, 2005, St. Louis, MO.*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2004, Anaheim, CA.*
- ❖ *AFS 108th Metalcasting Congress and Exposition, 2004, Rosemont, IL.*
- ❖ *ASME Heat Transfer/Fluids Engineering Summer Conference, 2004, Charlotte, NC.*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2003, Washington, DC.*
- ❖ *AFS 107th Casting Congress and Exposition, 2003, Milwaukee, WI.*
- ❖ *AFS 106th Casting Congress and Exposition, 2002, Kansas City, MO.*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2002, New Orleans, LA.*
- ❖ *Joint ASME-European Fluids Engineering Summer Meeting, 2002, Montreal, Canada.*
- ❖ *ASME International Mechanical Engineering Congress and Exposition, 2001, New York, NY.*
- ❖ *Southeastern Conference on Theoretical and Applied Mechanics – XX, 2000, Pine Mountain, GA.*
- ❖ *2nd International Symposium on Two-Phase Flow Modeling and Experimentation, 1999, Pisa, Italy.*
- ❖ *Energy Week’97: Drilling & Production Operations Conference, 1997, Houston, TX.*

- ❖ *Seventh International Symposium* on Gas-Particle Flows, Joint ASME/JSME Fluid Engineering Conference, 1997, Vancouver, BC, Canada.
- ❖ *International Conference* on Mechanics of Drilling Technology, 1991, Grozny, USSR
- ❖ *International Conference* on Relaxation Phenomena and Properties of Polymers, 1990, Voronezh, USSR
- ❖ *Forum* on Non-Newtonian Systems in Oil Production, 1989, Ufa, USSR
- ❖ *National Conferences* on Mechanics of Anomalous Systems, 1986 and 1977, Baku, USSR
- ❖ *National Conference* on Theory of Mechanical Processing of Polymer Materials, 1985, Perm, USSR
- ❖ *Annual Rheology Conferences*, 1978-1994, USSR

Reviewed Proposal:

National Science Foundation, Washington, DC, 2008-2010

International Science and Technology Center, Los Alamos National Laboratory, NM, 2003

PRIOR RESEARCH SUPPORTS

1. **PI:** “High Performance Turbojet Engine Nano-Lubricant”, **New Mexico NASA EPSCoR, New Mexico Space Grant Consortium, from 10/01/08 through 03/31/10 (Total: \$100,000).**
2. **Co-PI:** “New Mexico Tech Explosives Engineering HS-STEM Program”, **DHS Science & Technology Directorate, University Programs, Homeland Security Science, Technology, Engineering and Mathematics(HS-STEM) Career Development Program, Award No. 2008-ST-104-000011, 2008-2011 (Total: \$400,000).**
3. **NMT PI and Program Director:** “Structural Health Monitoring and Self-Healing of Aerospace Structures”, **NASA EPSCoR, 2007-2011 (Total \$1,500,000).**
4. **PI:** “Technology on In-Situ Gas Generation to Recover Residual Oil Reserves”, **U.S. Department of Energy, National Energy Technology Laboratory, Grant No. DE-FC26-05NT15478, from 10/1/05 through 02/29/08 (Total cost: \$700,985)**
5. **PI:** “A New Stimulation Technique to Improve Low Permeable Well-Bore Zone Characteristics”, **The Stripper Well Consortium, from 01/01/2009 through 6/30/2010 (total \$235,798)**
6. **Participant:** “A Model for Participatory, Collaborative STEM Learning”, **CCRAA Grant with Amarillo College, TX, Department of Education (Total: \$3,242,767; NMT: 1,498,709; Mechanical Engineering Department at NMT: \$387,000)**
7. **PI:** “Pilot Tests of ISGGT Technology in Muscogee Oilfield”, **Global Technology Transfer, Inc., from 12/15/2008 through 06/15/2010 (\$50,000)**
8. **Co-PI:** “CRIF:MU Acquisition of a Raman Microscope for Education and Research”, **NSF Chemistry Division, CRIF-MU Instrument Acquisition Program CHE-0632071, 2007 (\$150,000)**
9. **Co-PI:** **NASA’s Office of Life and Microgravity Sciences and Applications under Cooperative Agreement No. NCC8-128, 1995-2000**
10. **Co-PI:** **National Textile Center, US Department of Commerce, 1999-2002**
11. **Co-PI:** **NASA’s Space Product Development at Marshall Space Flight Center under Cooperative Agreement No. NCC8-240, 2000-2004**

12. **PI:** “Magnesium Low Pressure Development”, **USCAR and USAMP Magnesium Program, 2003-2004**
13. **US PI:** “Experimental and CFD Studies of Rheological Characteristics and Transport Properties of Viscoelastic Composite Systems Used in Oil Industry”, **ANSF/CRDF Azerbaijan-U.S. Bilateral Grants Program, 2004-2005 (\$35,000)**
14. **PI:** “Enabling Technology for the Design of Short-Fiber Reinforced Aluminum MMC Components”, **American Foundry Society, 2004**
15. **US-PI:** “Deformable Cast Iron as an Alternative for Steel Components of Oil Well Equipment”, **U.S. CRDF, First Steps to Market Program, from 01/05/06 through 12/31/06 (\$25,000)**
16. **PI: Air Force Safety Center, IPA Program, from 01/10/11 through 01/10/14 (Total: \$430,302)**
17. **Project Manager:** “Mitigating Space Debris Hazards to Air Force Space Systems”, **US Air Force**
18. **Project Manager:** “Structural Health Monitoring of Spacecrafts”, **US Air Force**
19. **Project Manager:** “Re-entry Breakup Recorder”, **US Air Force**

PENDING RESEARCH SUPPORTS

PI: “Integrated Research and Education on Multifunctional Materials and Composites”, National Security Science and Engineering Faculty Fellowship, **Department of Navy, 2015-2020, \$1,160,000** (submitted white paper).

Co-PI: “New Mexico – Columbia – Penn State MRSECs Partnership for Multifunctional Materials and Composites”, **NSF PREM, 2015-2020, \$2,444,273.00** (Submitted).

PI: “A Novel Approach of Aircraft Safety Analysis”, **United States Air Force Academy, USAFA-BAA-2015, 2015-2018, \$360,000** (White Paper is submitted).

PI: “Undergraduate Spaceflight Center – NM HSI Perspective”, **NASA MUREP, 2015-2020, \$700,322** (Submitted).

PI: “A Self-Healing Crosslinking Nano-Composite Material for Mitigating Wellbore CO₂ Leakage”, **U. S. Department of Energy**, Office of Fossil Energy, National Energy Technology Laboratory. *Intelligent Monitoring Systems and Advanced Well Integrity and Mitigation*. Funding Opportunity Number: DE-FOA-0001240. CFDA Number: 81.089 Fossil Energy Research and Development. **2015-2018, \$796,086** (submitted).

JULIE DYKE FORD
Professor, Technical Communication
Mechanical Engineering Department
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EDUCATION

- Ph.D. in Rhetoric and Professional Communication** 2001 New Mexico State University
Dissertation: *Knowledge Transfer Across Disciplines: Tracking Rhetorical Strategies from a Technical Communication Classroom to an Engineering Classroom* Directed by Stephen A. Bernhardt
- M.A. in English**
Emphasis: Technical Writing/Rhetoric and Composition 1998 University of North Carolina at Charlotte
- B.A. in English**, Elon University; Elon, NC 1995

AWARDS

- Distinguished College of Arts and Sciences Alumni Award, Elon University, 2015
Graduate Student Association Faculty Appreciation Award, New Mexico Tech, 2015
Sphar Outstanding Female Graduate Student in English Award, New Mexico State University, 2000
Mike Watts Leadership Award, New Mexico State University Graduate School, 2000
Society for Technical Communication, Graduate Scholarship, 1999-2000
Graduate Assistant of the Year, University of North Carolina at Charlotte, 1998

PEER-REVIEWED PUBLICATIONS

- “Enhancing the Connection to Undergraduate Engineering Students: A Hands-on and Team-Based Approach to Fluid Mechanics.” *Journal of STEM Education: Innovations and Research*. With Tie Wei. May-July 2015.
- “Learning Beyond the Classroom and Textbook: Workplace Enculturation via Technical Communication Client Projects and Internships.” *IEEE Transactions on Professional Communication*. With Elisabeth Kramer-Simpson and Julianne Newmark. June 2015.
- “Quad Charts in the Classroom to Reinforce Technical Communication Fundamentals.” *Journal of Technical Writing and Communication*. With Tie Wei. Hard copy In press. Advance Online version published March 24, 2015, available as doi: 10.1177/0047281615578848
- “Creating a Culture of Communication: A Graduate-Level STEM Communication Fellows Program at a Science and Engineering University,” *Across the Disciplines: A Journal of Language, Learning, and Academic Writing*. With Steve Simpson, Rebecca Clemens, and Drea Rae Killingsworth. July 2015.
*The same chapter to be reprinted in *Graduate Writing Across Disciplines: Identifying, Teaching, and Supporting*. Fort Collins, CO: The WAC Clearinghouse.
- “Introduction to Special Issue on International Engineering Communication.” With Marie Parette. Fall 2013. *connexions journal*. *An article from this issue was awarded the CCCC 2015 best article on Pedagogy or Curriculum in Technical or Scientific Communication.
- “An Academic Ejournal as TC Client Project: Enculturation, Production, and Assessment.” With Julianne Newmark. November 2012. *Technical Communication*.
- “Integrating Communication into Engineering Curricula: An Interdisciplinary Approach to Facilitating Transfer at New Mexico Institute of Mining and Technology.” Summer 2012. *Composition Forum*.
- “The Evolution of a Technical Communication Senior Thesis Project.” With Jessica Behles. Spring 2012. *Perspectives on Undergraduate Research and Mentoring*.
- “Emphasizing Research (Further) in Undergraduate Technical Communication Curricula: Involving Undergraduate Students with an Academic Journal’s Publication and Management” With Julianne Newmark. Summer 2011. *Journal of Technical Writing and Communication*

- “Building the Research Group at New Mexico Tech: Increasing Visibility of the Technical Communication Program. With Clinton R. Lanier. March 2011. *Programmatic Perspectives*
- “The Two-Semester Thesis Model: Emphasizing Research in Undergraduate Technical Communication.” With Jennifer Bracken and Greg Wilson. Fall 2009. *Journal of Technical Writing and Communication*. *nominated for an NCTE award
- “The role of Front-line Management in Anti-unionization Employee communication: America West Airlines vs. the Teamsters Union.” With Lorelei Ortiz. Summer 2009. *Journal of Communication Management*.
- “The Convergence of Technical Communication and Information Architecture (Part II): Creating Single-Source Objects for Contemporary Media.” With Richard K. Mott. August 2007. *Technical Communication*.
- “The Convergence of Technical Communication and Information Architecture: Managing Single-Source Objects for Contemporary Media.” With Richard K. Mott. February 2007. *Technical Communication*.
- “Choose Sunwest: One Airline’s Organizational Communication Strategies in a Campaign Against the Teamsters Union.” With Lorelei Ortiz. 2007. *Journal of Technical Writing and Communication*.
- “The Right Answer is Communication When Capstone Engineering Courses Drive the Questions.” With Scott Teare. *Journal of STEM Education: Innovations and Research*. July-December 2006
- “Teaching the Role of Language in Managing Organizational Change: The Sunwest Anti-Union Campaign Case.” With Lorelei Ortiz. *IEEE Transactions on Professional Communication*. June 2006
- “Student Perceptions of Communication: Undergraduate Engineers’ Views of Writing and Speaking in the Classroom and Workplace.” *Journal of STEM Education: Innovations and Research*. Jan.-Jun. 2006
- “Knowledge Transfer Across Disciplines: Tracking Rhetorical Strategies from a Technical Communication Classroom to an Engineering Classroom.” *IEEE Transactions on Professional Communication*. Dec.2004
- "From Medical Writer to Communication Specialist: Expanding Roles and Contributions in Pharmaceutical Organizations." With S.A. Bernhardt and G. C. Cuppan. *American Medical Writers Association*. June 2004
- “Integrating Communication and Engineering Curricula: A Look at Curricula, Courses, and Support Systems.” With Linda Riley. *Journal of Engineering Education*. October 2003
- “Like Pulling Teeth or Pain-Free?: Complexities in Collaboration in a Business Communication Course.” *Association for Business Communication Conference Proceedings*. Oct. 2003
- “The Big Chill: A Conversation with Seven Professionals Ten Years After They Graduated with Master’s Degrees in Technical Communication.” With Greg Wilson. *Technical Communication*. May 2003
*Also reprinted in *How to Conduct and Evaluate Research in Technical Communication*, authored by Mike Hughes and George Hayhoe, published 2008 by Lawrence Erlbaum Associates.
- “Blurring Boundaries Between Technical Communication and Engineering: Challenges of a Multidisciplinary Client-Based Pedagogy.” With Patricia Wojahn, Linda Riley, Stuart Brown, and Edward Hensel. *Technical Communication Quarterly*. Spring 2001
- “Getting Dissed: Technical Communicators in Multidisciplinary Engineering Teams.” With Patricia Wojahn. *IEEE Transactions on Professional Communication. Conference Proceedings*. Sept. 2000

TEACHING EXPERIENCE

Academic Positions

Professor, Mechanical Engineering Department, New Mexico Institute of Mining and Technology, Socorro, NM. Summer 2013-present

*Develop and teach graduate and undergraduate communication courses. Coordinate junior/senior design clinic (20+ client-based projects involving over 130 students). Evaluate communication modules for junior and senior design clinic teams. Advise undergraduate majors. Engage in departmental service activities.

Associate Professor, Mechanical Engineering Department, New Mexico Institute of Mining and Technology, Socorro NM. Fall 2011-Spring 2013.

Developed and taught graduate and undergraduate communication courses. Evaluated communication modules and evaluated communication outcomes for junior and senior design clinic teams. Advised undergraduate majors.

Associate Professor of Technical Communication, Communication, Liberal Arts, Social Sciences Department, New Mexico Institute of Mining and Technology, Socorro, NM. Spring 2007- present

*Served as Technical Communication Program Director from Fall 2004-Summer 2012

Assistant Professor of Technical Communication, Communication, Liberal Arts, Social Sciences (formerly Humanities) Department, New Mexico Institute of Mining and Technology, Socorro, NM. Fall 2003- Fall 2006

*granted tenure and promoted in Spring 2007

Adjunct Graduate Faculty, M.A. in Communication Program, University of Dubuque, Dubuque, IA, 2002- 2003

Graduate Teaching Assistant, English Department, NMSU, Las Cruces, NM, 1998- 2001

Technical Communication/Engineering Design Coordinator, NMSU, Las Cruces, NM, Spring 2000

Graduate Teaching Assistant, English Department, UNC- Charlotte, Charlotte, NC, 1997- 1998

Courses Taught

Technical Writing	Communication in Engineering
Advanced Technical Writing	Document Design
Composition	Advanced Composition
Persuasive Communication	Workplace Writing
Instructional Writing	Technical Communication for Teachers
Technical Communication Internship	Article Writing for Mass Media
Writing/ Presentation Center Workshop	Professional Writing Workshop
Orientation to Technical Communication	Technical Communication Community Service
Senior Seminar	Senior Thesis*
Junior Design Clinic	Senior Design Clinic
Introduction to Spaceflight	

***Directed Following Senior Thesis Projects resulting in peer-reviewed publication:**

Jessica Behles "The Use of Online Collaborative Writing Tools" *Technical Communication*
 Penny Bencomo "Strengthening Technical Communication with Educational Theory" *Xchanges*
 Rebecca Birch "Mobile, Handheld Devices with Touchscreens" *Xchanges*
 Joseph Friedman "Common Elements of Effective Screencasts" *Xchanges*
 T. Daniel Griffin "Intermediate-level Communication" *Xchanges*
 Greg Koch "The Benefits of Using Web Content Management Systems" *Xchanges*
 Linda Lambert "Socialization of the New Hire in the Workplace" *Xchanges*
 Lysandwr McNary "Cybersecurity Computer Based Training and Technical Communication Design" *Xchanges*
 Tony Perreault "Analysis of Web Content Delivered to a Mobile Computing Environment" *Xchanges*
 Danielle Rose "Video Social Media: A Reference for Integrating and Applying Video Social Media" *Xchanges*

GRANTS

Principal Investigator- "Collaborative Research: From School to Work: Understanding the Transition from Capstone Design to Industry." Innovations in Engineering Education, Curriculum, and Infrastructure division of NSF. Collaborative proposal with Virginia Tech (lead institution), University of Colorado Boulder, and Smith College. Submitted 10/29/15 for \$125,532. Pending.

Advisory Board Member- "Lifting the Barriers: Understanding and Enhancing Approaches to Teaching Communication and Teamwork Among Engineering Faculty." Innovations in Engineering Education,

Curriculum, and Infrastructure division of NSF. Principal Investigators: Holly Matusovich, Marie Paretto, Karl Smith. Submitted January 2010. Funded in amount of \$379,181.

Principal Investigator- "Written and Oral Communication in an Engineering Senior Design Course." Effective University Instruction Research Grant. Center for Teaching Excellence, Eastern New Mexico University. 2005-2006. *Awarded \$2700*

ADDITIONAL PUBLICATIONS

Chapters in Edited Collections

"Writers Among Engineers and Scientists," lead author of multi-authored chapter in *Program Profiles*, Jim Nugent, Greg Giberson, Lori Ostergaard, editors. 2015. Utah State University Press.

"Intersections between a Technical Communication Program and an Engineering Department," in *Sharing Our Intellectual Traces: Narratives Reflections from Administrators of Professional, Technical Scientific Communication Programs*, Tracy Bridgeford, Karla Saari Kitalong, Bill Williamson, editors. 2014. Baywood Press.

"Mentorship, Collegiality, and Friendship: Making Our Mark as Professionals," multi-authored chapter in *Stories of Mentoring*, Michele Eble and Lynee Gaillet, editors. 2008. Parlor Press.

Conference Proceedings

"Rethinking Work Spaces and Improving Curb Appeal: Making Changes to an Undergraduate TC Lab." *CPTSC Proceedings*. 2010. Available at <http://cptsc.org/pro/2010.pdf>

"Bored? Broke? Start a Research Group!" *CPTSC Proceedings*. 2008. Available at <http://cptsc.org/pro/2008.pdf>

"Communicating Design: A Multidisciplinary Approach towards Engineering Capstone Design Courses." With co-author Scott Teare. *SUN International Conference on Teaching and Learning*. 2006. Available at <http://sunconference.utep.edu/SunHome/2006/proceedings2006.html>

"Recognizing the Programmatic Advantages of a Bliki Blogiverse." With co-author Richard K. Mott. *CPTSC Proceedings*. 2005. Available at <http://www.cptsc.org/conferences.html>

"Recruitment Strategies for Professional and Technical Communication Programs: Strategies for Attracting High School Students to Technical Communication Programs." *CPTSC Proceedings*. 2004. Available at <http://www.cptsc.org/conferences.html>

"Tracking and Maintaining Communication With Graduates of Technical Writing Programs: What Can Former Students Tell Us?" *CPTSC Proceedings*. 1999 Available at <http://www.cptsc.org/proceedings/1999/CPTSCproc99.pdf>

"Embedding Industry Documents in Technical Communication Programs." *CPTSC Proceedings*. 1998. Available at: <http://www.cptsc.org/proceedings/1998/CPTSCproc98.pdf>

Non-Refereed Reviews, Reports, and Texts

"Dorothy A. Winsor's *Writing Power*." Book review for *Technical Communication Quarterly*. Autumn 2004

"Maximizing Training Effectiveness in the Workplace: Adult Learning and Writing Training." McCulley/Cuppan LLC White Paper. March 2002

"New Mexico Highway 44: Input on Data Needs for Economic Impact Analysis." Co-authored with Linda Riley. New Mexico Transportation Research Department. September 2000

"Technical Communication: Readings and Rationale." Multi-authored. *NMSU Course Text*. August 2000

"Listservs: Connecting Students with Practitioners." *Intercom*. Jul./Aug. 2000

Creative Work

"The Engineer and the Poet" original creative work published in *Din Magazine*, issue #1, May 2010

“Finding and Maintaining Balance in Grad School” published in *GradTalk*, volume 2, issue #1, March 2010

“Mandatory Evacuation” and “Disillusioned Academic” original creative works (poetry) published in *Santa Fe Poetry Broadside*, issue# 58, April 2009.

CONFERENCE PRESENTATIONS

“Engineering Connections.” Council for Programs in Technical and Scientific Communication. Sept. 2014.

“Location, location, location! The Role of Technical and Professional Writing and Communication Programs Within or Alongside Writing Programs.” Writing Program Administration Conference. July 2012

“So, What about Graduate Students? Strategies for Building Cross-Campus Graduate Writing Initiatives.” Writing Program Administration Conference. July 2012

“Undergraduate Technical Communication Research: Creating Publication Opportunities” Rocky Mountain Modern Language Association. October 2010

“Rethinking Work Spaces and Improving Curb Appeal: Making Changes to an Undergraduate TC Lab.” Council for Programs in Technical and Scientific Communication. September 2010.

“Bored? Broke? Start a Research Group!” Council for Programs in Technical and Scientific Communication. October 2008

“Connecting Undergraduate Students with Practitioners Through Senior Thesis Projects.” Poster presentation. Association for Teachers of Technical Writing. April 2007

“Technical Communication Classroom Blogs: A New Rhetorical Opportunity.” Rocky Mountain Modern Language Association. October 2006

“Communicating Design: A Multidisciplinary Approach Towards Engineering Capstone Design Courses.” Presented with Scott Teare. SUN International Conference on Teaching and Learning. March 2006

“Recognizing the Programmatic Advantages of a Bliki Blogiverse: Using Blogs to Connect TC Faculty, Students, and Corporate Board Members.” Presented with Richard K. Mott. Council for Programs in Technical and Scientific Communication. October 2005

“Responding to the Threat of Unionization: One Airline’s Use of Organizational Communication Strategies During a 2004 Teamster’s Campaign.” With Lorelei Ortiz. Association for Teachers of Technical Writing. March 2005

“Recruitment Strategies for Professional and Technical Communication Programs: Strategies for Attracting High School Students to Technical Communication Programs.” Council for Programs in Technical and Scientific Communication. October 2004

“Learning, Connecting, and Applying: Technical Writing and the Transfer of Rhetorical Strategies.” Conference on College Composition and Communication. March 2004

“Like Pulling Teeth or Pain-Free?: Complexities in Collaboration in a Business Communication Course.” Association for Business Communication Annual Convention. October 2003

“It’s Going to Break Your Heart But I Never Thought About Audience: The Rhetorical Awareness of Engineering Students.” Conference on College Composition and Communication. March 2002

“How are We Doing/What are We Doing: Conversations with Graduates Reveal the Real World of Technical Communication.” With Greg Wilson. Association of Teachers of Technical Writing. March 2002

“Bridging Scenes of Practice: Learning Transfer from Technical Communication Classes to Senior Engineering Project Teams.” Conference on College Composition and Communication. March 2001

“Knowledge Transfer Among Disciplines: A Study of Application of Rhetorical Strategies Among Engineering Students.” Rocky Mountain Modern Language Association. October 2000

“Getting Dissed: Working in Teams with Engineers and Technical Writers.” With Patricia Wojahn. IEEE Professional Communication Society. September 2000

“Tracking and Maintaining Communication With Graduates of Technical Writing Programs: What Can Former Students Tell Us?” Council for Programs in Technical and Scientific Communication. Oct. 1999

“Learning to Write in the Organization: An Exploration of the Socialization Process.” Rocky Mountain Modern Language Association. October 1999

“Embedding Industry Documents in Technical Communication Programs.” With Lisa Daidone. Council for Programs in Technical and Scientific Communication. October 1998

“Hypertext: The Changing Roles of Reader, Writer, and Text in an Electronic Age.” Popular Culture Association. October 1997

CHAired SESSIONS AT CONFERENCES

“Across Disciplinary Lines: Fostering Connections and Seizing Opportunities at New Mexico Tech.” Council for Programs in Technical and Scientific Communication. September 2014.

“Outcomes and Reassessment of Programmatic Change.” *Session Chair*. Council for Programs in Technical and Scientific Communication Annual Conference. September 2010

“Improving the Interface of Technical Communication.” *Session Chair*. Association of Teachers of Technical Writing Annual Conference. March 2005

“History and Methods of Writing Assessment.” *Session Chair*. Conference on College Composition and Communication. March 2005

“Shaping Knowledge by Using Engineering Genres in Teaching Technical Communication.” *Session Chair*. Association of Teachers of Technical Writing Annual Conference. March 2004

“Does Size Matter?: Writers’ Intentions Versus Audiences’ Perceptions in Organizational Newsletter Publishing.” *Session Chair*. Northwest Communication Association. April 2003

“Technical Communication: The Workplace and Beyond.” *Session Chair*. Rocky Mountain Modern Language Association. October 2000

INVITED ENGINEERING COMMUNICATION PRESENTATIONS AND WORKSHOPS

“Communicating Engineering Research Effectively.” Guest lecture for Bioengineering 189. March 2015.

“Three Minute Speech Presentations.” Workshop for STEM graduate students presenting at NM Legislative session. January 2015

“Effective Technical Presentations: How to Talk Nerdy.” Guest lecture for Introduction to Engineering Design Course. October 2014, February 2013

“Effectively Using PowerPoint to Communicate Your Research and Design Work.” Guest lecture for Electrical Engineering Senior Design Course. October 2012

“Public Speaking Does Not Have To Be Feared More than Death.” Guest lecture for Environmental Engineering Living Learning Community Course. November 2011

“PowerPoint Presentations Should Not Be Painful.” Guest lecture for Environmental Engineering Living Learning Community Course. November 2011

“Communicating Design: Strategies for Effective Writing and Speaking,” guest lecture for Mechanical Engineering Design Clinic. September 2011

“Effective Engineering Thesis Writing: Tips for Clear and Organized Communication (and Sanity Preservation),” invited presentation for Mechanical Engineering Graduate Faculty Seminar. April 2011

“An Overview of Technical Communication Strategies for Engineering Design Projects,” guest lecture for Dr. Keith Miller’s junior and senior mechanical engineering design courses, September 2010

“Engineers CAN Write (and Speak too): Integrating Communication Into Engineering Curricula,” invited presentation for Mechanical Engineering Graduate Faculty Seminar. August 2010

“Technical Writing: A Review of the Concepts and Tips for Successful Application,” guest lecture for Dr. Warren Ostergren’s junior and senior mechanical engineering design courses. August 2007 and August 2006

"Communication in Engineering Education." Workshop presented for NMT Engineering faculty. February 2004

“Remembering Your Audience: Planning and Writing Technical Reports.” New Mexico State University, Engineering College Senior Design Course. March 2000

“Leave Your Index Cards at Home: Tips for Presenting Technical Information with PowerPoint.” New Mexico State University, Engineering College Senior Design Course. April 2000

INVITED PRESENTATIONS AND WORKSHOPS

“Three Minute Speech Strategies.” Guest lecture for Mary Dezember’s English 341 course. October 2015.

“Using Canvas in a Distance Education Course to Appeal to Different Learning Styles.” Presentation at CITL Workshop on Learning Styles. June 2015.

“Writing Well Will Take You Far.” Workshop presented to Cottonwood Valley Charter School Eighth grade class. May 2015.

Tenth Muse Poetry Reading. (New Mexico Tech National Poetry Month celebration). April 2015

Three Minute Speech Competition, Workshop for NMT Student Research Symposium. March 2015.

“New Mexico Tech Technology and Commercialization Initiatives Overview.” Presented to New Mexico Legislative Committee on Science, Technology, and Telecommunications.” New Mexico Tech. October 2014

“The Tech Experience: Research, Design and Student Success.” Presentation at Student Success Summit, University of New Mexico. September 2014

Three Minute Speech Competition, Workshop for NMT Student Research Symposium. March 2014.

“New Mexico Tech Technical Communication: Blending Creativity, Science, and Technology with Communication.” Keynote address for Albuquerque Counselor’s Luncheon. October 2011.

“Your Committee Has Your Draft, Now What?: Preparing for Your Thesis Defense,” Oral Presentation Center workshop co-presented with Melissa Kammerer and Marcia Bardy. April 2011

“New Mexico Tech Poets Share Their Work,” creative reading for the Rocky Mountain Modern Language Association annual conference. October 2010

“Effective Strategies for Using PowerPoint in the Classroom and to Communicate Your Research,” presentation for New Mexico Tech new graduate student orientation. August 2014, August 2013, August 2012, August 2009, August 2008, August 2007

“Four Poets and an Artist” Poetry Reading (New Mexico Tech National Poetry Month celebration). April 2009

“Organizational Communication, Persuasion, and Unionization: A Major U.S. Airline vs. the Teamsters Union.” New Mexico Tech Humanities Colloquium. September 2008

“Achieving Balance,” workshop for New Mexico Tech student leaders. September 2008

- “Effectively Using PowerPoint to Communicate Your Research,” workshop for New Mexico Tech graduate student research conference. September 2007
- “Setting Individual Goals for Success,” workshop for New Mexico Tech student leaders. September 2007
- “Individual Goal Setting: Achieving Healthy Mind and Body Balance,” workshop for residents of Baca Hall, a designated living community. August 2007
- “The Scholarly Stage: Academic Conference Presentations,” guest lecture for Glenda Stewart-Langley’s advanced public speaking class. April 2007
- “Avoiding Butterflies: Tips for Presentation Preparation.” NM Tech Graduate Student Association Conference. February 2006
- “Surviving the Phone Interview: Strategies for Effective Preparation and Performance.” With Lynda Walsh. NM Tech Graduate Student Association Conference. February 2006
- “Nuts and Bolts of Grant Writing: How to Style a Proposal.” With Lynda Walsh. NM Alliance for Graduate Education and the Professoriate. Grant Proposal Development Workshop. April 2005
- “Interviewing Do’s and Don’ts.” Glenda S. Langley’s Speech 242 class. April 2005
- “PowerPoint Do’s and Don’ts: Strategies for Effective Presentations.” NM Alliance for Graduate Education and the Professoriate. October 2004
- "Collaboration in the Classroom: Recognizing Conflict and Managing Complexities." New Mexico Tech Humanities Colloquium. April 2004
- “*Interrogating the Web: An Interdisciplinary and International Model for Web Design and Assessment.*” New Mexico State University, Doctoral Colloquium. September 1999

SERVICE FOR THE INSTITUTION

Promotion to Professor Committee, Chair (2014-2016) Member (2013-2014)

Faculty Development Committee Member (2014-2016)

Academic Affairs Vice President Search Committee Member (2013-2014)

President’s Faculty Liaison Committee Member (2013-2014)

New Student Advising Program (HSI-STEM Grant), Advisor to 45 MENG majors (current)

Peer Mentoring Program, Director, Supported by Title V PPOHA Grant (2011-2013)

Oral Presentation Center Director (2010-2014)

Established Oral Presentation Center, a campus resource devoted to helping graduate and undergraduate students from all disciplines plan and prepare PowerPoint presentations and conference posters.

Technical Communication Program Director (2004-2012)

Developed and implemented recruitment initiatives. Coordinated program assessment. Communicated with Corporate Advisory Board and planned annual board meeting. Established local internship opportunities. Met with prospective students. Represented program at new student orientation and high school visitation days.

New Mexico Tech Policies and Procedures Documentation Project, Director (2010-2011)

Academic Search Committees

Mechanical Engineering, 2014, Electrical Engineering, 2005

Technical Communication, 2011-2012, 2007 Technical Communication, Chair, 2008, Composition, 2007

Tenure and Promotion Committees

Serve as member of 2 Mech. Engineering tenure committees and 1 Technical Communication tenure committee

Served as chairman for two CLASS faculty committees

Served as outside member for Electrical Engineering and Earth and Environmental Science candidates

Master of Science Teaching Program, Thesis Committee Member (Ruth Babcock, Robert Quinones)

Faculty Sponsor, New Mexico Tech Track Club

Previous Institute-Wide Committee Work and Service

Academic Standards and Admissions Committee member	Distance Education Committee Member
Master of Science Teaching Program, Committee Member	Macey Scholarship Selection Committee Member
General Degree Requirements Assessment Committee Member	New Faculty Mentoring Program Participant
Electrical Engineering Senior Design Presentations, Reviewer	President's Lunch Run Organizer
STEM Communication committee	Math 103 Distance Education Committee
Title V Sustainability committee	Student Research Symposium committee

SERVICE OUTSIDE THE INSTITUTION**Council for Programs in Technical and Scientific Communication (CPTSC)**

Member, 2016 Nominating Committee
 Conference reviewer, 2012, 2011, 2010, 2008, 2005
 CPTSC Conference Co-Chair, 2009 Aarhus, Denmark
 Member at large (elected position), Executive Committee, 2008-2010

Association for Teachers of Technical Writing

Member at large (elected position), Executive Council, 2007-2009
 ATTW session chair, 2005 and 2004 conference
 Conference reviewer, 2014

IEEE Professional Communication Society

Conference reviewer for 2010 international conference in Enschede, Netherlands.

Guest Editor, Fall 2013 Special Issue of *Connexions* (international engineering communication focus)**Peer Reviewer/Textbook Reviewer**

Technical Communication, Technical Communication Quarterly, Journal of Engineering Education, Advances in Engineering Education, IEEE Transactions on Professional Communication, IEEE Transactions on Education, Journal of Technical Writing and Communication, Programmatic Perspectives, connexions, Oxford, Taylor and Francis, Prentice Hall, Bedford/St. Martin's

External reviewer for tenure candidates at peer institutions, Fall 2014, Fall 2011, Fall 2010, Fall 2009.

Tresco Inc., Board of Directors, Spring 2012-current

PROFESSIONAL COMMUNICATION EXPERIENCE

Technical Writer and Researcher, College of Engineering, NMSU. Las Cruces, NM. 2000

Writing Consultant, ABET Accreditation Team, College of Engineering, NMSU. Las Cruces, NM. Spring 2000
Communication Consultant and Researcher, McCulley/Cuppan LLC, Salt Lake City, UT. 1999- 2003

PROFESSIONAL DEVELOPMENT

Attended STEM Student Mentoring workshop, Teaching Academy at NMSU, September 2011

Attended Turnitin professional development webinar, December 2010

Participated in STC Kachina Panel on Careers in Technical Communication, October 2007, March 2006

Attended "Designing Courses that Help Students Learn," workshop by Karl Smith, February 2006

Participated in "Exploring a Communication Model for Web Design," international week-long workshop at University of Washington, July 1999

Ashok Kumar Ghosh, Ph.D., PE

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Office: (575)-835-5505
Fax: (575)-835-5209
Professional Engineer (NM)

EDUCATION

- Ph.D. Engineering - Indian Institute of Technology (IIT), Kharagpur, INDIA, 1993
Dissertation: Static, Stability and Vibration Analysis of Laminated Composite Plates using Higher Order Shear Deformation Theory with Finite Element Discretization.
(copy of the dissertation is available at:
<http://site.ebrary.com/lib/nmtpublic/reader.action?docID=80166542>)
- M.S. Structural Engineering - Washington State University, Pullman, WA, USA, 1985
Thesis: Buckling of Cantilever Cylindrical Shells Subjected to Unsymmetrical Lateral Pressure.
- B. Tech (Honors) – Civil Engineering - Indian Institute of Technology, Kharagpur, INDIA, 1983

CERTIFICATION

TVC (Technology Venture Corp., Albuquerque) certificate holder for Center for Commercialization and Entrepreneurial Training (CCET)

WORK HISTORY

CURRENT RESEARCH

Master's Thesis Supervised:

1. Development of an improved Method for Computational Finite Element Analysis, Keng-I Lin, Master's Independent Study, Mechanical Engineering, May 2015.
2. Characterization of a Fluid Filled Composite for Radiation Protection, Leroy Garley Jr, Master's thesis submitted in Spring 2015.

MS Committee Member

Development of a Miniature Tensile Kolsky Bar for Dynamic Testing of Thin Films, Master's student Justin Paul, May 2015.

Invited Talk:

Technology, Engineering and Economic Feasibility for Brackish Groundwater Desalination, at the “Understanding New Mexico’s Brackish Groundwater Resources” conference, July 23rd, 2015, Albuquerque, NM.

Symposium Attended:

SMD Symposium Wargame 2015, Huntsville, Alabama, August 2015.

Funding Secured:

As PI of STTR University Partner for Phase I of Missile Defense Agency’s project, “Integrated Health Sensing for Highly Efficient Weapon Inspection and Sustainment”, \$40k.

Recent project/proposal Involvement:

- a) Awarded DOE Visiting Faculty Position at Los Alamos National Laboratory Summer of 2015.
- b) Invited to submit phase II of the STTR project under MDA14-T001- Integrated Health Sensing for Highly Efficient Weapon Inspection and Sustainment. Proposal is due on December 18, 2015.
- c) Submitted SBIR Phase I proposal for A15-106: Hybrid Thermoplastic Matrix Fabrication Methods for Missile Structures, sent on October 20, 2015 – Decision pending.
- d) Final Report was produced for Phase I of the STTR project under MDA14-t001- “Integrated Health Sensing for Highly Efficient Weapon Inspection and Sustainment” on October 21, 2015. A video on the final report is available at http://breeze.nmt.edu/MDA_Executive_Summary

Publication Involvement:

- a) Based on the summer research involvement at Los Alamos National Laboratory a manuscript on “Pressure Induced Fluid Flow in Open-Cell Polyurethane foam” will be sent to Polymer, an International Journal for the Science and Technology of Polymers, Elsevier Publication, authors: Ashok K Ghosh and Carl M. Cady.
- b) The paper “Thermal Management Characteristics of a Fluid-Filled Porous Composite – An Experimental Investigation” will be presented at the 1st International Conf. on Heat and Mass Transfer, Thiruvanthapuram, India, December 2015.
- c) The paper “Development of a Carbon Nanotube Flow Sensor” will be presented at 4th International Conference on Advanced Nanomaterials & Nanotechnologies, IIT Guwahati, December 2015.
- d) The paper “Concentration Retention and Enrichment of Ammonia Bicarbonate Draw Solution in Forward Osmosis Desalination”, will be presented by Dr. Panda, at the conference Desalination for the Environment : Clean Water and Energy, Rome, Italy, May 2016, authors, Panda, Morgan and Ghosh.

Past Work Experience:

- 2009 – Present: Associate Professor, Mechanical Engineering and Adjunct Faculty, Civil Engineering, New Mexico Tech (NMT)
- 2004 – 2009: Assistant Professor, Mechanical Engineering and Adjunct Faculty, Civil Engineering, NMT
- 2003 – 2004: Visiting Assistant Professor, Civil and Environmental Engineering, NMT
- 2001 – 2003: Adjunct Lecturer/Researcher III, Civil Engineering, University of New Mexico (UNM), Albuquerque, NM
- 1997- 2001: Associate Professor, Civil Engineering, Indian Institute of Technology (IIT), Kharagpur
- 1996-1997: Assistant Professor, Civil Engineering, Indian Institute of Technology (IIT), Kharagpur
- 1994-1996: Visiting Assistant Professor, Southern Illinois University, Carbondale, IL
- 1987-1994: Assistant Professor/Lecturer, Civil Engineering, Indian Institute of Technology (IIT), Kharagpur
- 1986-1987: Design Engineer, Development Consultant Pvt. Ltd., Vashi, India

TEACHING EXPERIENCE

At New Mexico Tech (NMT), I have taught around 45 courses of which around 20 were taught either for the first time or developed newly. These courses belong to Mechanical Engineering and Civil Engineering. I had also taught Engineering Economics to a number of engineering disciplines at NMT and at UNM.

ORGANIZATION OF SHORT TERM COURSES

- A) 1st National Workshop on Ageing and Restoration of Structures, January 11-12. 2001

Objectives:

The objective of this workshop is to bring the issue of structural rehabilitation into focus. This is the very first workshop in this field in the country, which aims at bringing the experts from Industry, Academia, R & D Institutions, and Railways on a common platform to discuss the issue, share their expertise, and disseminate their knowledge and experience.

Coverage of the workshop includes: 1) Hostile Environment; 2) Ageing of Structures in Hostile Environment; 3) Diagnose the Structural Health; 4) Load Capacity Evaluation; 5) Strengthening and Restoration; and 6) IT Based Maintenance System.

- B) A 3-day Certificate Course on Workshop Practices on RHS/SHS for Fabricators, April 26-28, 1999.

Objectives:

The objectives of this certified course is to expose the fabricators with the correct shop practice on: 1) Marking, 2) Cutting, 3) Bending, 4) Holing, 5) Flattening, 6) Welding and 7) Shop and

field splicing. A number of lectures are also incorporated in this course to give the participants the basics as well as some recent advances in the following:

- Welding of Structural Sections
- Welding Technology and
- Introduction to Structural Analysis.

C) Finite Element Method – Application in Engineering, Nov. 30th to Dec. 4th 1998.

Objectives:

Course material is designed keeping in mind the requirement of Government Departments, Consulting Engineers and Indian Industries including the Software World.

D) Application of Finite Element Method in Engineering, May 30th to June 10th, 1994

Objectives:

Topics followed were: 1) Matrix Algebra and FORTRAN programming; 2) Variational Principle; 3) Elasto-Plastic Analysis; 4) Analysis of Plates and Shells; 5) Composite Structures and 6) Soil-Structure and Fluid-Structure Interactions.

PATENT AWARDED / PENDING

Patent Awarded

- A) Energy Attenuation Structure, US Patent # 7,947,364, May 2011
<http://infohost.nmt.edu/~ashok/Energy.pdf>

Abstract:

An energy-attenuation structure comprising a core layer of cellular material. Substantially most of the cells of the cellular material are open cell, with those cells disposed in the central portion of the core layer being more open than are the those cells disposed in outer portion of the core layer. The openness of the cells generally decreases from the interior of the core layer in a direction towards the outer portions. At least some of the cells of the core layer are filled with a fluid.

- B) A Laser Based System for Vibration Analysis - Indian Patent # 209239, 2007
<http://www.allindianpatents.com/patents/209239>
- C) Layered Insulating Building Blocks (LIBB) - Indian Patent # 203374, 2007
<http://www.allindianpatents.com/patents/203374>

Patent Pending

- D) Method and Apparatus for Reducing the Total Dissolved Solids of a Solution
<http://www.google.com/patents/US20130056414>

Abstract:

Method and apparatus for reducing the total dissolved solids of a solution. A feed solution is conveyed to at least one first chamber of a unit, and a draw solution is conveyed to at least second chamber thereof. A semi-permeable member arrangement is disposed between each of the first and second chambers. The draw solution has a greater molar concentration than does the feed solution. Solvent from the feed solution is drawn through the membrane arrangement into the draw solution, reducing the solute concentration of the draw solution and increasing the solid concentration of the feed solution. Paddles provide continuous sweeping of opposite external surfaces of the membranes to at least reduce solute depositions on the surface facing the feed solution chamber, and to remove liquid permeate molecules from that external surface of the membranes that faces a draw solution chamber.

BOOK CHAPTER PUBLISHED

“Chapter 35 on Structural Testing Applications” in Springer handbook of Experimental Solid Mechanics

(<http://www.springer.com/new+%26+forthcoming+titles+%28default%29/book/978-0-387-30877-7?detailsPage=toc>)

Abstract of the book chapter

This chapter addresses various aspects of testing of a structural system. The importance of “the Management Approach” to planning and performing structural tests (ST) is emphasized. When resources are limited, this approach becomes critical to the successful implementation of a testing program. The chapter starts with illustrations on some of the past structures that were built using concepts developed through testing. Most often, these structures were built even before the principles of engineering mechanics were understood. At present, due to the unprecedented expansion of computing power, numerical and experimental techniques are interchangeably used in simulating complex natural phenomena. Despite encouraging results from simulation and predictive modeling, structural testing is still a very valuable tool in the industrial development of product and process, and its success depends on judicious choice of testing method, instrumentation, data acquisition, and allocation of resources. A generic description of the current test equipment and types of measurements is included in this chapter. After careful selection, three case studies were included. The complexity involved with the modeling of structural steel retrieved from the collapse site of the World Trade Center (WTC) under High-Rate and High-Temperature is highlighted in the first case study. The second case study highlights the importance of the planning phase in providing the basis for a manageable and high-quality testing of concrete highway bridges. The final case study details the development of a Lightweight Automobile Airbag from inception through innovation. This case study also illustrates the close ties between structural testing and numerical simulation. The chapter closes with examples of a few future structural systems, highlighting the complexity involved in their testing. Complete chapter is available at:

http://infohost.nmt.edu/~ashok/1b_Book_Chapter.pdf

RESEARCH PROJECTS

Recent project/proposal Involvement:

- a) Invited to submit phase II of the STTR project under MDA14-t001- Integrated Health Sensing for Highly Efficient Weapon Inspection and Sustainment. Proposal is due on December 18, 2015.
- b) SBIR Phase I proposal for A15-106 : Hybrid Thermoplastic Matrix Fabrication Methods for Missile Structures, Submitted on October 20, 2015. – Decision pending.

Completed project

- a) Phase I STTR Topic: MDA14-T001- Integrated Health Sensing for Highly Efficient Weapon Inspection and Sustainment, October 20, 2014 **as NMT PI** to, a small business
- b) A Novel Multi-Functional Composite Material for Radiation Protection for NASA Spacecraft and Astronauts (**PI**) – Funded by NM Space Grant Consortium, 2012, (\$56,750). Collaboration with Dr. Ram K. Tripathi, a Senior Research Scientist at NASA Langley Research Centre and Dr. Ming Tang, Technical staff at Los Alamos National Laboratory.

ABSTRACT:

This seed fund was used to determine the radiation shielding characteristics of a novel multifunctional Composite Material (MFCM) that was developed for other characteristics under a grant from the Office of Naval Research (ONR). Under the proposed grant, the material was exposed to radiation in a “Tandem ion accelerator” at Los Alamos National Laboratory (LANL). Leroy, a graduate students at NMT pursued the same investigation and wrote his independent study report. He developed a durable lightweight material that could shield humans and other radiation sensitive objects. He started with a computer simulation of the composites using the software “Stopping and Ranging of Ions in Materials” (SRIM). SRIM results showed that different interstitial compounds were able to magnify the energy absorption properties of the base material. Computer simulation results were validated by actual exposure of the samples to different levels of high-energy radiation. After the exposure, samples were cut from the skin layers (front and rear) to determine the influence of fluid characteristics on strengths and toughness in the skin layers. The complete report is available at <http://site.ebrary.com/lib/nmtpublic/docDetail.action?docID=80164790>.

- c) Membrane Technology for Produced **Water** in Lea County (**Technical Lead**)– Funded by US Department of Energy through NETL, 2008-2011 (\$ 1,306,739)
<http://www.netl.doe.gov/research/oil-and-gas/project-summaries/completed-env/de-nt0005227>

ABSTRACT:

This is to disclose a process for desalination of water with very high total dissolved solids (TDS) using multi-chambered concentric circular raceway. The system is developed to suit field application in terms of keeping the main reactor open and the design involved such processes

that can be powered by renewable energy sources. Constant sweeping of the membrane surface provides a prolonged maintenance free life.

Outcome:

- i. **Supported:** 4 faculty, 1 – Post Doctoral Researcher, more than 8 graduate students, and more than 15 undergraduate students
- ii. **Collaborated** with a number of companies:
 1. Controlled Recovery Inc., Hobbs,
 2. Hydration Technologies Inc., Albany, Oregon
 3. Mosaic, Carlsbad, NM
 4. Intercontinental Potash Corporation, Hobbs.
- iii. **Technology was presented** to secure funding to
 1. **Senator Tom Udall** on January 21, 2011 at Hobbs
 2. **Congressman Steve Pearce** on April 18, 2011 at Hobbs
 3. Intercontinental Potash (ICP) on February 28, 2011.
- iv. **Technology invented:** NMT is applying for a patent on “Mechanically Enhanced Multi-chambered Concentric Circular Raceway”. The application material is getting ready by the patent attorney. Tentative date for filing is mid August, 2011.
- v. **MS Thesis Defended**
 - (a) MS thesis on “A Forward Osmosis-Based Treatment Process for High TDS Oilfield Produced Water” by Hilda Asempro. Defended in December 2009, New Mexico Tech.
 - (b) MS thesis on “Recapture Of Ammonia And Carbon Dioxide In A Forward Osmosis Based Treatment”, by Gedion Sarpong, Defended in December 2010, New Mexico Tech.
- vi. **Related Publications** [Manuscripts are in preparation]
 - a. Panda B.C., Ghosh A.K. and Romero V.D. (2010), “Desalination by Forward Osmosis: Status, Issues and Opportunities”, **Desalination**.
 - b. Panda B.C., Morgan H. and Ghosh A.K. (2011) “ Concentration retention and enrichment of ammonia bicarbonate draw solution in Forward Osmosis desalination” **Desalination and Water Treatment**.
- vii. **Presentation in Reviewed Conference**
 - a. A.K.Ghosh, B.C.Panda, M.Hensley, G.Sarpong and H.Morgan (2010) “ A Pilot Scale Treatment Process for High TDS Oil Field Produced Water”, 17th Annual International Petroleum & Biofuels Environmental Conference, August 30 - September 2, 2010, San Antonio, TX, USA [Dr. Panda presented the paper at the conference].
 - b. A.K.Ghosh, V.Romero, F.Yarger, and H.Asempro, Desalination of High TDS Produced Water using Forward Osmosis, 16th Annual International Petroleum

& Biofuels Environmental Conference, August 30 - September 2, 2009, Houston, TX, USA [Dr. Yarger presented the paper at the conference].

- d) A Novel Material for an Adaptive and Stealth Naval Platform (**Principal Investigator**), CNR Challenge project funded by Office of Naval Research, 2009-2010, (\$100,000). Complete report is available at:
http://infohost.nmt.edu/~ashok/ONR_Report.pdf

Outcome:

- i. **Supported:** 1 Post Doctoral student, 1 graduate student and 4 undergraduate students
 - ii. **MS Thesis** “The Impact Characteristics of quick-recovery polyurethane foam sandwich composite” by Naitram Birbahadur, will defend next week.
 - iii. **New Mexico Space Grant Scholarship**

Phillips Chavez, an undergraduate in Mechanical Engineering received the New Mexico Space Grant Consortium Undergraduate Scholarship for his work on “A Novel Material for an Adaptive and Stealth Naval Platform”.
 - iv. **KOAT TV video** based on our research on “Students Explore Submarine Materials” was aired on February 12, 2010.
- e) Standards for Tire-Bale Erosion Control and Bank Stabilization – Engineering Validation of Existing Practice and Implementation, (**Principal Investigator**), funded by New Mexico Department of Transportation (NMDOT),
- i. 2008-2010 (phase I) – (\$150,000) and
 - ii. 2011-2012 (phase II) – (\$60,000) .
- [Supported 3 graduate students, 1 undergraduate student and 5 faculty members]
- f) Prototype Design of Zeolite Membrane Reverse Osmosis Desalination Unit, (**Technical Lead**), funded by Office of Naval Research, 2006-2008, (\$586,000) [supported 1 faculty, 1 graduate student and 3 undergraduate students].
- g) Demonstration of the Proof of Concept of Carbon Nanotube Flow Sensors, NSF EPSCoR Nano science mini grant, (**Principal Investigator**), **2005 and 2006**, [partial support for 1 Graduate student].
- h) **UNM - Involved in the project “Simulation of Loss of Coolant Accident (LOCA) in Nuclear Power Plant”**, (Post Doctoral Researcher), Involved in experimental and parametric study, funded by Nuclear Regulatory Commission (NRC), 2001-2003. Two publications were generated.

- i) UNM - Development of a Sensor “Smart Bearing Pad”, for Highway Bridges that will be able to determine the overweight vehicle in motion, funded by NMDOT, 2001-2003.

PUBLICATIONS (IN PEER REVIEWED JOURNAL)

- [1] A.K.Ghosh, A.D.Williams, J.M.Zucker, J.L.Mathews and N. Spinhirne, ”An Experimental Investigation into the Acoustic Characteristics of Fluid-filled Porous Structures – A Simplified Model of the Human Skull Cancellous Structures”, J. of Experimental Mechanics, April 2008.
- [2] A.K.Ghosh, Kerry J. Howe, A.K.Maji, B.C. Letellier, R.C. Jones, “Head Loss Characteristics of a Fibrous Bed in a PWR Chemical Environment”, Nuclear Technology, Feb.2007, Vol. 157, No 2 pp. 196-207.
- [3] A.K.Ghosh, A. K. Maji, M. T. Leonard, D.V. Rao, B. Letellier, G. Urgessa and S. Ashbaugh, “Accumulation and Head Loss Characteristics of Selected Pressurized Water Reactor LOCA-Generated Debris”, Nuclear Technology, April 2006, Vol. 154, No 1 pp. 69-84.
- [4] A. K. Ghosh, “Structural Testing Applications – Chapter 35 in the handbook of Experimental Solid Mechanics”, published by Springer, 2008.
- [5] B.C.Panda & A.K.Ghosh, “Structural behavior of Concrete Block Paving – Part I: Sand in bed and Joints, J. of Trans. Engg., ASCE, 2002, Vol. 128, No. 2, pp. 123-129.
- [6] B.C.Panda & A.K.Ghosh, “Structural behavior of Concrete Block Paving – Part II: Concrete Blocks, J. of Trans. Engg., ASCE, 2002, Vol. 128, No. 2, pp. 130-135.
- [7] B.C.Panda & A.K.Ghosh, “Equivalent Elastic Modulus of Block Layer in interlocking Concrete Block Pavement”, The Indian Concrete Journal, Vol. 74, No. 11, Nov. 2001, pp. 735-741.
- [8] B.C.Panda & A.K.Ghosh, “Sources of Jointing Sand for Concrete Block Pavement”, J. of Materials in Civil Engineering, ASCE, May/June, 2001, Vol 13, No 3, 235-239.
- [9] B.C.Panda & A.K.Ghosh, “Bedding and Jointing Sand for Concrete Block”, Highway Research Bulletin, Indian Road Congress, New Delhi, No 64, Vol 1, pp. 45-59, 2001.
- [10] B.C.Panda & A.K.Ghosh, “Influence of Block Parameters on load spreading ability of interlocking Concrete Block Pavement”, The Indian Concrete journal, Nov. 2000, pp. 650-656.
- [11] B.C.Panda & A.K.Ghosh, “Concrete Block Pavements – A Critical Review”, Indian Road Congress, Indian Highways, Oct 2000, pp. 27-37.

- [12] B.C.Panda & A.K.Ghosh, "Influence of Grain Size Distribution on Dilatancy of Sand, J. of Institution of Engineers (I), Vol 81, Aug 2000, pp. 68-71.
- [13] B. C. Panda & A.K.Ghosh, "Structural Modeling and design of Interlocking Concrete Block Pavement", The Indian Concrete Journal, Vol 73, No 2, Feb 1999, pp. 123-127.
- [14] A. K. Ghosh & M. Ramesh, "Dynamic Analysis of Supporting Structures of Mobile Antenna", Computers and Structures, Vol 63, pp. 633-637, 1997.
- [15] A.K.Ghosh & K.C.Biswal, "Free Vibration Analysis of Stiffened Laminated Plates Using Higher Order Shear Deformation Theory", Finite Element in Analysis and Design, 22, 1996, pp. 143-161.
- [16] A.K.Ghosh & S.S.Dey, "Buckling of Laminated Plates – A Simple Finite Element Based on Higher Order Theory", Finite Element in Analysis and Design, 15, 1994, 289-302.
- [17] K.C.Biswal & A.K.Ghosh, "Finite Element Analysis for Stiffened Laminated Plates Using Higher Order Shear Deformation Theory", Computers and Structures, Vol 53, No 1, pp. 161-171, 1994.
- [18] A.K.Ghosh & S.S.Dey, "Free Vibration of Laminated Composite Plates – A Simple Finite Element based on Higher Order Theory", Computers and Structures, Vol 52, No 3, pp. 397-404, 1994.
- [19] N.C.Pal & A.K.Ghosh, "An Experimental Investigation on Impact Response of Laminated Composite Beams", Experimental Mechanics, June 93, Vol 33, No 2, pp. 159-163.
- [20] A.K.Ghosh & S.S.Dey, "A Simple Finite Element for the Analysis of Laminated Composite Plates", Computers and Structures, Vol 44, No 3, pp. 585-596, 1992.
- [21] S. Jerath & A.K.Ghosh, "Buckling of Cylindrical Shells Subjected to Non-Uniform Pressure", Computers and Structures, Vol 25, No 4, pp. 607-614, 1987.

Publications (in Conference Proceedings)

- [22] A. K. Ghosh, "High Strain-Rate response of a Bio-mimetic Multifunctional composite", ACMFMS 2012 proceedings, New Delhi, 2012, India.
- [23] A.K.Ghosh, "A Status Report on Reliability of Wind Turbine Blades", Society of Experimental Mechanics (SEM) Symposium, June 2010, Indianapolis, IN.
- [24] E.Sewell, P.Chavez & A.K.Ghosh, "Novel Sandwiched Composite Materials? An acoustic Investigation", SEM Symposium, June 2010, Indianapolis, IN.
- [25] A.K.Ghosh, "40 minute presentation on "An Expt. Investigation into the Impact Characteristics of Fluid-filled Structures for an undersea vessels", SEM Symposium, June 2010, Indianapolis, IN.

- [26] P.Chavez, E. Sewell & A.K.Ghosh, "Designing and Developing a Fluid filled porous composite Panel for Naval Platforms", SEM Symposium, June 2010, Indianapolis, IN.
- [All 4 papers, i.e. 22 to 25, could not be presented due to unavoidable reason]
- [27] J.L.Mathews & A.K.Ghosh, "Blast Loading on a Bio-inspired Visco-elastic Plate Structure – An Overview", SEM International Congress, June 2008, Orlando, FL.
- [28] A.K.Ghosh & J.L.Mathews, "An Experimental Investigation into the Explosive Characteristics of Fluid-filled porous Structures – A Simplified Models of the Human Skull Cancellous Structure", 45th Annual Technical Meeting of the Society of Engineering Science, Oct 2008, Uni. Of Illinois at Urbana Champaign.
- [29] J.L.Mathews & A.K.Ghosh, "A Biomimetic Composite Structure Subjected to Impact Load", SEM Annual meeting, June 2007, Springfield, Mass.
- [30] H.Donarumma, S.Ota, J. Macias & A.K.Ghosh, "My Favorite Experiment - Thermodynamics & Us", June 2007, Springfield, Mass.
- [31] J.L.Mathews, J. Metzger & A.K.Ghosh, "Shock and Vibration Characteristics of a Bio-inspired Structure Under Blast Loading", Society of Experimental Mechanics (SEM), Annual meeting, June 2006, St. Louis, MO.
- [32] A. K. Ghosh & A. Williams, "Investigation of a Natural Structure", SEM Annual Conf., June 2005, Portland.
- [33] A.K.Ghosh, "Finite Element Analysis of Stiffened and Unstiffened laminated Composite Plates and Experimental Verification", March 2004, Houston, 9th ASCE Aerospace Div. Int. Conf.
- [34] M.Leonard, A.K.Maji, A.K.Ghosh, B.Latelier & C.Shaffer,"Debris Accumulation and Head Loss data for Evaluating the Performance of Vertical PWR recirculation Sump Screens", Workshop on Debris Impact on Emergency Coolant Recirculation, Feb 2004, Albuquerque, NM.
- [35] K.Howe, A.K.Ghosh, A.K.maji, B.lateleir & R.Johns, "effects of Debris generated by Chemical Reactions on Head Los Through Emergency Coolant recirculation", Workshop on Debris Impact on Emergency Coolant Recirculation, Feb 2004, Albuquerque, NM.
- [36] A.K.Ghosh & A.K.Maji, "Smart Bridge Bearing Sensor System", SEM Annual Meeting, June 2003, Charlotte, NC.
- [37] A.K.Ghosh, "Concrete Block Pavement – A Cost Effective Option", 40th paving and Transportation Conf., Jan 2003, Albuquerque, NM.
- [38] A.K.Ghosh, "A Step by Step procedure to Diagnose the Structural Health of a Bridge", Proc. Of 1st national Workshop on Ageing and Restoration of Structures, Jan 2001, IIT Kharagpur.

- [39] A.K.Ghosh, “Industry and Institute are in harmony”, proc. 3rd National Conf. on Construction, Feb 2000.
- [40] A.K.Ghosh, “Flyash based technology for Road Embankment and elsewhere”, Workshop by CESC, April 2000, Kolkata.
- [41] B.C.Panda and A.K.Ghosh, “Concrete Block Pavement – A way to Go”, 2nd national Conf. on Construction, march 1999.
- [42] Bagchi & A.K.Ghosh, “Design and Modify the Conventional conveyance system for flyash disposal”, proc., Int. Conf. on flyash disposal and utilization, Jan 1998.
- [43] B.C.Panda & A.K.Ghosh, “Constraints with BIS (IS:3812) specifications on flyash and future proposal”, proc. Int. conf. on flyash disposal and utilization.
- [44] A.K.Ghosh, “Nondestructive evaluation of Fracture in Micro Fiber Reinforced Cellular Concrete”, Indo-US workshop at Uni. of Roorkee, Dec 1996.
- [45] A.K.Ghosh et al, “NDE of Fracture in an Ultra Lightweight Cement Composite”, Proc. 8th Int. Congress of SEM at Nashville, June 1996
- [46] Y.P.Chugh, A.K.Ghosh et al, “Development and lab. Testing of lightweight CRB on Structural Material for Underground Mines”, Proc. Of Power Congress, Chicago, Oct 1995.
- [47] A.K.Ghosh, “A Constructional Failure – Safety Aspects”, national Seminar on Construction Management at Patiala, Oct. 1989.

Other Presentation:

- [48] Poster presentation at NM WRI 59th Annual Water Conference at Santa Fe , on Nov 18-19, 2014.
- [49] Presentation of the final report on “Membrane Technology for Produced Water in Lea County”, at Morgan Town, WV, June 21, 2011, to National Energy Technology Laboratory.
- [50] Invited presentation on “Desalination of High TDS Oilfield Produced Water” at Hobbs, for Emergent Technologies Inc., January 21, 2011
- [51] Presentation to Senator Tom Udall at Hobbs, on January 21, 2011 on “Desalination of High TDS Oilfield Produced Water”.
- [52] Presentation to Congressman Steve Pierce on April 18, 2011, at Hobbs, on “Commercial potential for the technology of desalination of High TDS Oilfield Produced Water”

MAJOR INDUSTRIAL PROJECTS

In Albuquerque, NM

- a) **Solar Thermal** Water Heating System Installation at Kirtland Air Force Base Aquatic Training Center, Albuquerque, NM, 2010, Professional Engineer for Technical and Economic Analysis.
http://infohost.nmt.edu/~ashok/AFRL_Solar.pdf

In India:

- b) Design and Testing (Load and Nondestructive) of Highway Bridges on National Highway 5 – **A World Bank Project**
- c) Design and Laboratory Investigation on Embankment using fly ash from an area Power Plant – **A World Bank project.**
- d) Laboratory Investigation on “Alkali-Aggregate reactivity”, - **A World Bank project.**

COLLABORATION

A number of collaborations initiated and followed through as given in the Table below.

Name and affiliation	Collaborative effort	Outcome
Mr. Kenneth G. Blemel Vice President of R & D Management Sciences, Inc	Collaborated in three proposals: 1) NASA, 2) MDA and 3) DTRA	Funded for \$100,00 – MDA (STTR)
Dr. Kam W. Ng, Ph.D., P.E. Director of Business Development Noise Control Engineering, LLC	Collaborated in a proposal to NFL/GE/UA	Efforts are ongoing
Dr. Reed Selwyn, UNM Dept. of Radiology, Chief Medical Physics	Collaborated in a ARMY SBIR proposal	Pending - decision
Dr. Ravi Jain, professor UNM Center for High Tech Materials		
Dr. Craig J. Kief, Dy Director COSMIAC, UNM		
Dr. Ram K. Tripathi, is a Senior Research Scientist at NASA Langley Research Centre	Proposal on :A Novel Multi Functional Composite Material for Radiation Protection for NASA Spacecraft and Astronauts	Funded for \$56,750
Dr. Carl Cady and Dr. Ming Tang, Technical staff, Los Alamos National Laboratory		
Prof. Bruce Thompson, Regent's Professor, Dept. of Civil Engineering, UNM	Proposal on: Forward Osmosis Based Solution to the Produced Water Problem: A Path to Commercialization", Submitted to DOE, May 2011,	Not funded (\$5 million)
Patrick V. Brady, Senior Scientist, Sandia National Laboratories, Albuquerque, NM 87185		
Donald W. Smith, Associate Head of School, Albuquerque Academy	Proposal on Solar Technology – Project Based Learning", Submitted to the Office of Naval Research, May 2011	Not funded (\$535,109)
Prof. Van Romero, VP Research and Economic development, NMT	As Co-PI in two projects: Prototype Design of Zeolite Membrane Reverse Osmosis Desalination Unit – Funded by ONR Membrane Technology for Produced Water in Lea County (to be funded soon) by DOE	A NETL project was funded for \$ 1,306,739
Number of faculty from NMT who collaborated in various proposals are: 1. David Graw, Mechanical 2. Jamie Kimberley, Mechanical 3. Curtis O'Mally, Mechanical 4. David westpfal, Physics 5. Prof. Tanja Pietras, Chemistry 6. Prof. Bim Lim, Mechanical 7. Prof. B. Majumdar, Materials 8. Prof. John Wilson, E&ES 9. Rebecca Rice, Biology	Proposals were sent to DoD, WERC, SEM, Howard Hughes Medical Institute, AFOSR , ONR and others.	Some are pending and others not funded
Andrew Williams, DR-II Thermal Systems Lead Air Force Research Laboratory (AFRL),	During 2006, AFRL/RV conducted acoustic testing on fluid-filled, porous media in a four-microphone	The outcome of the effort has been a patent disclosure

Space Vehicles Directorate, Albuquerque	transmission loss tube. During 2007, more tests were performed. Future plan is to collaborate in the area of thermal properties of material for thermal control applications.	submitted by New Mexico Tech and a journal article entitled “An Experimental Investigation into the Acoustic Characteristics of Fluid-filled Porous Structures: A Simplified Model of the Human Skull Cancellous Structure,” in the Journal of Experimental Mechanics in April 2008.
Jonathan Zhuker, High Explosive Physics Team, Los Alamos National Lab.	As a student of “Engineering Mechanics of composite Structures” he did his project on the mathematical modeling of fluid filled cellular structures.	Co-authored in the paper ““An Experimental Investigation into the Acoustic Characteristics of Fluid-filled Porous Structures: A Simplified Model of the Human Skull Cancellous Structure,” in the Journal of Experimental Mechanics in April 2008.
Walter Gerstle, Ph.D., PE Professor, Structural Engineering University of New Mexico Albuquerque	The New Mexico Department of Transportation (NMDOT) is interested in obtaining the services of state engineering institutes to complete inspection and load rating of existing bridges and related structures.	A white paper is submitted on April 2008 to NMDOT to perform load ratings of a number of bridges in the state.
David Parsons Controlled Recovery Inc.	Controlled Recovery Inc. has interest in supporting the development of a treatment process using biological means such as Algae.	CRI is supporting in several ongoing projects as NMT partner.
Scott G. Vail, Ph. D. EHS Manager , Mosaic Potash Carlsbad Inc.	Mosaic is willing to make available access to the brine pond. During the field demonstration, they will provide test plots.	Mosaic is supporting in several ongoing projects as NMT partner.
John E. Higgins, AFRL, Albuquerque	An Education Partnership Agreement (EPA) was signed by AFRL [Point of contact (POC) as John E. Higgins] and NMT [with POC as A. K. Ghosh] during 2004 and is still in operation. [Attached copy of EPA]	This EPA provides an opportunity for NMT students to work in a technology rich area with excellent employment prospect. John E. Higgins is currently serving in the board of Mechanical Engineering Program.
Visit by AFRL scientists to NMT to establish collaboration	Eugene and Jim Guerrero of AFRL visited NMT on March 29, 2004.	Exchange of ideas based on which a proposal white paper (refer: B2-2004-1) was submitted.
As a part of development of collaboration with the Industrial/Government al organizations, few tours were organized with the NMT students from class of CE 201,	Feb. 20, 2004 - Tour to the Lafarge Construction Materials Plant at Albuquerque	Some internship programs were established
As a part of development of collaboration with the	Feb. 20, 2004 - Tour to GCC Cement Company	Some internship programs were established

Industrial/Government al organizations, few tours were organized with the NMT students from class of CE 201, Composite Technology Development Inc. (CTD) Colorado	Feb. 20, 2004 - Tour to GCC Cement Company	NMDOT Currently funding a project at NMT (refer : B2-2007-1)
	April 29, 2004 – Field trip to “New Mexico Department of Transportation’s (NMDOT) Materials Testing Laboratory in Santa Fe”	
	Collaboration in the area of Composite and Cellular solid materials and Energy dissipation technologies.	Collaboration in future projects is anticipated.

PROFESSIONAL INVOLVEMENT

- a) Seminar presentation at NASA Langley Research Center on June 19 on “A Bio-inspired Multi-functional Composite (MFC) for Radiation Protection of NASA Astronauts and Spacecraft”, June 2014.
- b) An invited talk at ASCE Fall Meeting at NMSU. The theme of this year's meeting is "Water and Energy in New Mexico". Topic of my talk is "The Science and Economics of Water Desalination using Forward Osmosis", 2013.
- c) Presented to Lauren, Abilene Texas and Sandbox Energy Resources (SER) and Erin Consulting “Development of a 125 barrel per day desalination System using Forward Osmosis” on September 25, 2013.
- d) Complete the business plan for attracting investment. The business plan got accepted for presentation at “DEAL STREAM SUMMIT 2013”. More on this summit can be found at <http://www.dealstreamsummit.com>
- e) Management Department, As a part of the Verge Fund Speaker Series, “challenges with Entrepreneurship, Nov. 15, 2013, MSEC 103
- f) Chaired two technical sessions at the ACMFMS 2012, New Delhi, India.
- g) Ph.D. Comprehensive examination committee for Carson)Yuanzhong) Qiu, Civil Engineering, University of New Mexico, Albuquerque, Dec. 2011.
- h) MS thesis committee for Bryan Estvanko, Civil Engineering Department, University of New Mexico, Albuquerque, Oct. 2011.
- i) Organized two sessions under “**Composite Materials**”, 2010 Society of Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 7-9, Indianapolis, 2010
- j) Organized a symposium on “Reliability of Wind Turbine Blades”, 2010 Society of Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 7-9, Indianapolis. 2010
- k) Organized two Field demonstrations of the Produced water desalination project. One at Jal County, South East New Mexico and the other at NMT campus, 2010
- l) Organized a meeting with HTI executives with that of NMT to collaborate in the “Membrane Desalination Project”, 2010
- m) Organized the last of the three Workshops on “Standards for Tire-bale Erosion Control and bank Stabilization Projects: Validation of Existing Practice and Implementation” for the NMDOT personnel, 2010
- n) Chair, **Composite Materials** Technical Division of Society of Experimental Mechanics

- o) Past Chair, **Structural Testing** Technical Division of Society of Experimental Mechanics.
- j) Society of Experimental International Congress and Exposition of Experimental and Applied Mechanics, Orlando, FL in June 2008, Organized session #13; Presented a paper; Chaired a session #13
- a) **Organized a symposium at Engineering Mechanics of Biologically Inspired Products and Structures**, 45th Annual Technical Meeting of the Society of Engineering Science (SES), Oct. 12-15, 2008, **University of Illinois at Urbana Champaign (UIUC)**

Prior involvements are given in a tabular form:

Year	Name of the conference	Symposium / Sessions organized
2007	Annual conference of SEM, Springfield, MA, June 2007	Organized session #18 on “Bioinspired Materials and Biomimetic Composites”
	43 rd Annual Technical meeting of the Society of Engineering Science.	
		Presented three technical papers.
2007 2006	Annual conference of SEM, Springfield, MA, June 2007	Co-organized a symposium on “Modeling and Characterization of Biological Materials and Biomaterials
	43 rd Annual Technical meeting of the Society of Engineering Science.	Organized 2-tracks out of 3-tracks 2 sessions organized (#56, #87) 2 papers presented
	Annual conference of SEM, St. Louis in June 2006	Chaired a session (#73)
	Annual conference of SEM, Portland, OR in June 2005	Organized 2 sessions (#58 & #79) 1 papers presented Chaired a session (#58)
2005 2004	SEM X International Congress and Exposition of Experimental and Applied Mechanics, Costa Mesa, CA in June 2004	Organized 5 sessions (#62, #69, #76, #83, #88) in Composites and Optical Method Organized 2 sessions (#100, #107) in Damage Mechanics and Structural Health Monitoring Chaired two sessions (#69, #100)
	Annual conference of SEM, Charlotte, NC in June 2003	Chaired a session (#39) 1 paper presented

SEM – Society of Experimental Mechanics;

SUPERVISING AND ADVISING OF STUDENTS

Awards and recognitions to advisee are:

- NASA SPACE Grant Scholarship was awarded to Shelby Fellows for her work in “Radiation Shielding Characteristics of the Composite Developed, 2013.
- Miquella Trujillo, a junior in Mechanical Engineering received the New Mexico Space Grant Consortium Undergraduate Scholarship for her work on “A Novel Multi Functional Composite Material for Radiation Protection for NASA Spacecraft and Astronauts”, under my supervision, 2011.
- Phillips Chavez, a senior in Mechanical Engineering received the New Mexico Space Grant Consortium Undergraduate Scholarship for his work on “A Novel Material for an Adaptive and Stealth Naval Platform”, under my supervision, January 2010.

Supervising/Advising:

Year	Names and descriptions of students	Involvement
2015	Leroy Garley, MS	MS Independent Study supervisor
2011	Carson (Yuanzhong) Qiu, Civil Engineering, University of New Mexico, Albuquerque, Dec. 2011	Ph.D. Comprehensive examination committee
	Shaun Geerts, MS in Mechanical Engineering	Member of the MS committee Topic: Pipe Fragmentation Analysis to Determine Performance Characteristics of Improvised Explosives, December 2011
	Bryan Estvanko, Civil Engineering Department, University of New Mexico, Albuquerque, Oct. 2011.	MS thesis committee
	Naitram Birbahadur, MS in Mechanical Engg.	Thesis supervisor Topic: The High Strain-rate Response of Polyurethane Foam and Kevlar Composite. May 2011
	David Chavez, MS in Mechanical Engg.	Thesis supervisor. Area of Research is "Application of the FFC towards better personal protection" (to be defended)
	Gedion Sarpong, MS in Environmental Engg. Abstract is given above	Thesis supervisor Topic: Recapture of Ammonia and Carbon di Oxide in a Forward Osmosis Based Treatment. September 2011
2010	Naitram Birbahadur and Chris Turner (partial) Phillip Chavez	The High Strain-rate Response of Polyurethane Foam and Kevlar Composite Involved with the Navy project. He received the NASA Space Grant Scholarship
	Hilda Asmpo, MS in Environmental Engg.	Thesis supervisor Topic: A Forward Osmosis Based Treatment Process for High TDS Oilfield Produced Water
2009	Jason Mathews, MS in Mechanical Engg.	Thesis supervisor. Title: Shock and Vibration Characteristics of a bio-inspired Structure Under Blast loading.
2006-2008	Nathan Glenn, MS in mechanical Engg.	Thesis: Application of Simulated High Frequency Pyrotechnic Shock to Electronic Boxes
2006	Lim Song Heng Angela Kar Min Josiah Garfield Bradley Dotson MS Mechanical Engg.	Master's thesis committee
2005	Girum Urgessa, Civil Engg. UNM	Ph.D. Dissertation Evaluation Committee
	Pratima Valavaka, Civil Engg., UNM	MS thesis committee
	Manish Jambhokar, Civil Engg. UNM	MS thesis committee

Before coming to New Mexico Tech, I supervised following students at IIT Kharagpur:

- 1 – Ph.D. Scholar towards Dissertation
- 12 – MS in structural Engineering and
- 18 – Undergraduate students for their BS thesis.

INVITED LECTURES

Year	Name of the institution	Topic of the lecture
2014	Seminar presentation at NASA Langley Research Center on June 19 on “A Bio-inspired Multi-functional Composite (MFC) for Radiation Protection of NASA Astronauts and Spacecraft”.	
2013	<p>An invited talk at ASCE Fall Meeting at NMSU. The theme of this year's meeting is "Water and Energy in New Mexico". Topic of my talk is "The Science and Economics of Water Desalination using Forward Osmosis".</p> <p>Presented to Lauren, Abilene Texas and Sandbox Energy Resources (SER) and Erin Consulting “Development of a 125 barrel per day desalination System using Forward Osmosis” on September 25, 2013.</p> <p>Complete the business plan for attracting investment. The business plan got accepted for presentation at “DEAL STREAM SUMMIT 2013”. More on this summit can be found at http://www.dealstreamsummit.com</p> <p>Management Department, As a part of the Verge Fund Speaker Series, “challenges with Entrepreneurship, Nov. 15, 2013, MSEC 103</p>	
2011	<p>Invited presentation on “Desalination of High TDS Oilfield Produced Water” at Hobbs, for Emergent Technologies Inc., January 21, 2011</p> <p>Senator Tom Udall on January 21, 2011 at Hobbs</p> <p>Congressman Steve Pearce on April 18, 2011 at Hobbs</p> <p>Intercontinental Potash (ICP) on February 28, 2011.</p>	
2010	Invited presentation on “Desalination of High TDS Oilfield Produced Water” at Hydration Technologies Innovation, Albany, OR, Dec. 23, 2010.	
2008	<p>Invited to the monthly luncheon talk of the New Mexico Society of Professional Engineers (NMSPE), Albuquerque, NM</p> <p>http://www.nmspe.org/</p>	Energy Attenuation of a Biologically Inspired Structure – A Patent pending Concept
2007	Invited speaker at 1 st New Mexico Consortium’s Institute for Advanced Studies (IAS) Los Alamos National Laboratory, A pril 20-21, 2007	Sensor Development
2005	Indian Institute of Technology, Guwahati	Teaching and Research at New Mexico Tech
2004	ASCE chapter’s June Meeting at Albuquerque	To introduce the NMT - ASCE Student chapter to the ASCE office bearers

	<p>American Concrete Institute's professional body at Albuquerque in April 2004</p>	<p>To introduce the NMT – ASCE Student chapter to the local ACI members. The outcome is the donation of some laboratory equipment to NMT and industrial trips by NMT students.</p>
	<p>Graduate Seminar in Civil Engineering, University of New Mexico</p>	<p>Structural Behavior of Concrete Block Pavement, April 21</p>

David Isaac Grow

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Fax: (575) 835-5209

EDUCATION

Ph.D. May 2011, Mechanical Engineering, Johns Hopkins University, Baltimore, MD

- Dissertation: Robot-assisted Modeling and Rehabilitation Strategies for Cerebellar Ataxia
- Primary Advisor: Dr. Allison Okamura (Mechanical Engineering)
Secondary Advisor: Dr. Amy Bastian (Neuroscience)

M.S. December 2006, Mechanical Engineering, University of Utah, Salt Lake City, UT

- Thesis: Harness Design for Two-Axis Torso Haptics
- Advisor: Dr. John Hollerbach (Computer Science)

B.S. August 2004 (with Honors), Physics, University of Utah, Salt Lake City, UT

- Thesis: Pressurization of Thermoacoustic Refrigerators
- Advisor: Dr. Orest Symko (Physics)

HONORS AND AWARDS

Best Paper Award, IEEE Green Technologies Conference, 2014
NIH Ruth Kirschstein National Research Service Award Predoctoral Fellowship, 2008 – 11
Departmental Outstanding Undergraduate Research Award, 2004
Departmental Outstanding Teaching Assistant Award, 2004
University of Utah Annual Autonomous Robot Competition: First Place, 2004
University of Utah Undergraduate Research Fellowship, 2003
Society of Physics Students Outstanding Chapter Award (president), 2003

EMPLOYMENT HISTORY

Assistant Professor, New Mexico Tech	August 2014 – present
Postdoctoral Fellow, Johns Hopkins University	April 2014 – August 2014
Kirschstein Predoctoral Fellow, Johns Hopkins University	January 2008 – April 2014
Research Assistant, Johns Hopkins University	August 2006 – December 2007
Research Assistant, University of Utah	September 2004 – August 2006

TEACHING EXPERIENCE

Smart Systems **Fall 2014**
Instructor, New Mexico Tech. A graduate-level course that advances the topics of closed loop control, learning/adaptive algorithms, and systems integration.

Introduction to Biomedical Engineering **Fall 2014**
Instructor, New Mexico Tech. A senior-level course providing an overview of research in biomedical engineering, biomechanics, biocompatibility, tissue engineering, biomedical instrumentation, and moral and ethical issues.

Robotics (Living Learning Community) **Fall/Spring 2014 – present**
Instructor, New Mexico Tech. A freshmen-level course covering the basics of circuits, mechanical design, modeling, and programming. Students from computer science, electrical, and mechanical engineering work in trans-disciplinary teams. Lab exercises build towards disaster-response themed robotics competition.

Biomedical Mechatronics **Spring 2013 – present**
Instructor, New Mexico Tech. A graduate-level course covering the kinematics and dynamics of human movement, computational modeling of biological tissue, and medical robotics (prostheses, orthotics, surgery, and rehabilitation).

Engineering Dynamics **Fall/Spring 2011 – present**
Instructor, New Mexico Tech. Undergraduate course in particle and rigid body dynamics covering force/acceleration, work/energy, and impulse/momentum methods.

Dynamic Systems and Controls **Fall 2011 – present**
Instructor, New Mexico Tech. Undergraduate course in classical control theory: dynamic modeling, system response, root locus, and controller design. Also *instructor* for associated laboratory since Fall 2014.

Haptic Systems for Teleoperation and Virtual Reality **Spring 2012**
Instructor, New Mexico Tech. Graduate-level course covering manipulator kinematics and dynamics, impedance and admittance control, teleoperation systems, human haptic sensing, and haptic rendering and design of virtual environments.

Design and Analysis of Dynamic Systems **Spring 2007**
Teaching Assistant, Johns Hopkins University. Senior-level course covering design, modeling, and control of dynamic mechanical and electromechanical systems.

Haptic Systems for Teleoperation and Virtual Reality **Fall 2006**
Teaching Assistant, Johns Hopkins University. Mentored semester-length student projects in haptics and related fields, gave one lecture, held office hours, and graded assignments.

Statics and Strength of Materials **Fall 2004**
Department of Mechanical Engineering, University of Utah
Teaching Assistant. Gave one lecture, held office hours, and helped prepare exams.

Physics for Scientists **2003–04**
Physics Department, University of Utah
Teaching Assistant. Taught a weekly recitation session, held office hours, and helped prepare exams.

Physics of Audio and Video **2003 – 04**
Physics Department, University of Utah
Teaching Assistant. Prepared and directed laboratory exercises on complex waves and Fourier analysis, loudspeakers, frequency response of audio systems, radio broadcasting, and magnetic and digital recording.

Physics, Astronomy, Differential Equations **2002 – 03**
Student-Athlete Services and Academics, University of Utah
Individual and Group Tutor. Prepared and presented supplemental instruction and led review sessions before exams.

RESEARCH
EXPERIENCE

My technical expertise is in human-robot interfaces — specifically in dynamic modeling, system identification, teleoperation, and human psychophysics. Past projects have included the design and construction of robotic devices for neurorehabilitation, clinical training, and remote handling of hazardous materials.

Robotic Interfaces

2011 – present

Robotic Interfaces Laboratory at New Mexico Tech

- Design of semi-autonomous controllers for mobile and aerial robots
- Development of intelligent explosive ordinance disposal (EOD) robots
- Kinematic and dynamic modeling of human motor control
- Design of classroom and clinical robotic training tools

Rehabilitation Robotics

2006 – 2011

Haptics Laboratory at The Johns Hopkins University and

Motion Analysis Laboratory at the Kennedy Krieger Institute, Johns Hopkins Medical Institutions

- Improved the sensing and safety characteristics of a KINARM robotic exoskeleton
- Dynamic modeling and system identification of a KINARM robotic exoskeleton
- Developed models of the cerebellum's role in human motor control
- Validated motor control models via cerebellar patient studies
- Investigated targeted rehabilitation techniques for cerebellar patients

Haptic Training Devices

2006 – 2008

Haptics Laboratory at The Johns Hopkins University and

Motion Analysis Laboratory at the Kennedy Krieger Institute, Johns Hopkins Medical Institutions

- Improved students physical intuition of dynamic systems by incorporating haptic devices and simulations into graduate, undergraduate, and grade school curricula
- Designed and fabricated robust haptic device to train physical therapists in assessment of muscle spasticity in children

Locomotion Interfaces for Virtual Environments

2004 – 2006

School of Computing, University of Utah

- Assisted in adding hydraulic tilt mechanism to Sarcos Treadport
- Designed and fabricated torso exoskeleton for Treadport
- Extended the Treadport's force feedback capability from 1-D (push pull) to 2-D in the sagittal plane
- Investigated the energetic, biomechanical, and psychological equivalence of actual vs. simulated sloped overground locomotion

Thermoacoustic Engines

2001 – 04

Center for Acoustic Cooling, University of Utah

- Designed and fabricated thermoacoustic prime movers and refrigerators
- Investigated the effects of working-gas pressurization on cooling efficiency

GRADUATE MENTORING	Fritz Hieb	Summer 2014 – present
	Innovative tools and techniques for bone density assessment.	
	Ashkan Pourkand	Summer 2014 – present
	Robotic training and assessment tools for orthopaedic surgery.	
	Chris White	Summer 2013 – present
	Dynamic stability of mobile and aerial robots during manipulation tasks.	
	David Patterson	Fall 2012 – present
Implementation and comparison of tip-over stability algorithms for mobile robotics.		
Lizzy Schares	Fall 2012 – Summer 2014	
Computational motor control of humans: real-time motion capture and visualization.		
David Siler	Fall 2012 – Summer 2014	
Teleoperation controller design for to improve quadrotor aircraft maneuvering.		
John Tidman	Fall 2012 – Summer 2014	
Frequency-domain characterization of ground surface for EOD robotic platforms.		
Ryan Grainger	Spring 2012 – Summer 2014	
Development of graphical programming environment for Mindstorms for mobile devices.		
UNDERGRAD. MENTORING	David Yoon	Summer 2014 – present
	Design and control of surgical assessment tools.	
	Amanda Innis	Spring 2012 – Spring 2014
	Low cost spasticity simulation training and assessment tool.	
	Chris Frederick	Spring 2012 – Fall 2012
	Experimental apparatus design and fabrication; sensor characterization (NSF AMP).	
	Jason Lee	Spring 2012 – Fall 2012
	Experimental apparatus design and fabrication; software development (NSF AMP).	
	Mario Naranjo	Spring 2012
	Modeling and assessment of a flywheel-based energy storage system (NSF AMP).	
Michael Tango	Summer 2010	
Proprioceptive guidance for handwriting in children with autism spect. disorder (NSF REU).		
Michael Locastro	Summers 2007 & 2008	
Design and fabrication of haptic device; system ident.; software development (NSF REU).		
Sugandha Arora	Summer 2007	
Mathematical models of muscle spasticity; software development (NSF REU).		
POSTDOC. FELLOWS	Curtis O'Malley	March – July 2012
	Component and system modeling of a flywheel-based energy storage system.	
DESIGN TEAM MENTORING	Surgical Skill Assessment Team	Fall 2014 – present
	Design of hardware and software for measuring performance during orthopaedic drilling.	
	Hand Study Team	Fall 2014 – present
	Design of robotic tool for functional anatomy study of the human hand.	
	Bone Drill Training & Assessment Team	Fall 2013 – Spring 2014
Design of haptic feedback training and assessment tool for orthopaedic drilling.		
Prosthetic Leg Feedback	Fall 2012 – Spring 2013	
Design of haptic feedback system to warn leg prosthesis user of potential buckling.		

Reduced Cost Heliostat

Fall 2012 – Spring 2013

Design and fabrication of assistive lifting technology for disabled individuals.

Ability One

Spring 2012

Design and fabrication of novel drive system; economic analysis.

Intrusion Detecting Security Door

Fall 2011 – Spring 2014

Design and fabrication; frequency-domain characterisation of intrusion and tampering events.

PEER-
REVIEWED
PUBLICATIONS

R. P. Grainger and D. Grow. Leveraging Mobile Devices to Enhance the Performance and Ease of Programming from Low-Cost Mobile Robots, *IJITE*. September 2014.

D. Grow, A. Bastian, A. Okamura. Testing Models of Cerebellar Ataxia via Dynamic Simulation, *Robotica*. September 2014.

D. Grow, A. Bastian, and A. Okamura. Robotic Assistance for Cerebellar Reaching, In Panagiotis Artemiadis (ed.), *Neuro-robotics: From brain machine interfaces to rehabilitation robotics*, Springer 2014.

D. Grow, M. Swanson, D. Patterson, and C. White. Advanced Control Architecture for EOD Robotics. In *ICRA Workshop on Human Robot Interaction*, Karlsruhe, Germany, May 2013.

N. Norton-Cormier, H. Humpman, T. Rushenberg, N. Alvarez, A. Smith, D. Patterson, and D. Grow. Designing and Constructing an Alternative Reduced-Cost Heliostat Drive System. In *IEEE Green Technologies Conference*, Denver, CO, April 2013.

D. Grow, N. Bhanpuri, S. Charles, A. Bastian, and A. Okamura. A Proposed Method for Correcting Coordination Deficits: Models and Simulations. In *ICRA Workshop on Softening Rehabilitation Robotics*, Anchorage, AK, May 2010.

D. Grow, M. Wu, M. Locastro, S. Arora, A. Bastian, and A. Okamura. Haptic Simulation of Elbow Joint Spasticity. In *16th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, pp. 475-476, Reno, NV, March 2008.

D. Grow, L. Verner, and A. Okamura. Educational Haptics. In *AAAI 2007 Spring Symposium - Robots and Robot Venues: Resources for AI Education*, Stanford, CA, March 2007.

D. Grow and J. Hollerbach. Harness Design and Coupling Stiffness for Two-Axis Torso Haptics. In *14th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, pp. 83-87, Washington, DC, March 2006.

J. Hollerbach, D. Grow, and C. Parker. Developments in Locomotion Interfaces. In *Proceedings of the IEEE International Conference on Rehabilitation Robotics*, pp. 522-525, Chicago, IL, July 2005.

D. Grow. Experiments on the Effects of Pressurization of a Thermoacoustic Refrigerator. In *University of Utah UROP Research Abstracts*, 4: Spring 2004.

EXTENDED
ABSTRACTS

A. Innis, I. Rodriguez-Rios, T. Pratt, S. Fellows, E. Trujillo, J. Tidman, J. Avila, J. Lee, and D. Grow. Drill Alignment Trainer for Orthopedic Surgery. In *Student Research Symposium*, Socorro, NM, April 2014.

D. Siler, and D. Grow. Stabilization of Quadcopter Flight Using Vibratory Feedback. In *Student Research Symposium*, Socorro, NM, April 2014.

O. Sugarman, V. Saeger, B. Newall, L. Hernandez, J. Tidman, and D. Grow. Finding Characteristic Signals in Vibration and Sound, a Feasibility Analysis for an Access Delay Security Door. In *Student Research Symposium*, Socorro, NM, April 2014.

C. White, D. Patterson, M. Andreani, L. Torres, and D. Grow. Force Feedback for Dynamic Tip-over Stability. In *Student Research Symposium*, Socorro, NM, April 2014.

A. Innis, E. Schares, and D. Grow. Low Cost Spasticity Simulation Device for Education. In *Student Research Symposium*, Socorro, NM, April 2013.

D. Patterson, C. White, and D. Grow. Visualization of Tipover Stability Measures for Mobile Robots. In *Student Research Symposium*, Socorro, NM, April 2013.

M. Rayl, A. Innis, C. Sniegowski, K. Carson, E. Trujillo, S. Wells, S. Werner, M. Williams, J. Lamberti, and D. Grow. Design of a Vibro-Tactile Feedback System for a Power Knee Prosthetic. In *Student Research Symposium*, Socorro, NM, April 2013.

T. Rushenberg, N. Alvarez, E. Hays, J. Anderson, D. Patterson, N. Norton, and D. Grow. Designing a Reduced-Cost Heliostat. In *Student Research Symposium*, Socorro, NM, April 2013.

E. Schares, A. Innis, and D. Grow. Motion Capture Analysis with Microsoft Kinect. In *Student Research Symposium*, Socorro, NM, April 2013.

J. Tidman and D. Grow. Frequency-Domain Surface Characterization for Mobile Robots. In *Student Research Symposium*, Socorro, NM, April 2013.

J. Kuker, S. Hussan, S. Martinez, C. Santistevan, Z. Taylor, D. Grow. Advanced Control Architecture for EOD Robots. In *Student Research Symposium*, Socorro, NM, April 2012.

M. Swanson, C. Frederick, and D. Grow. Design of an Intrusion Detecting Security Door. In *Student Research Symposium*, Socorro, NM, April 2012.

ABSTRACTS
AND POSTERS

D. Patterson, C. White, M. Andreani, D. Grow. Dynamic-Model-Based Stability of Mobile Manipulators. Abstract and poster in *ITEA System-of-Systems Workshop*, El Paso, Texas, March 2014.

D. Patterson, C. White, M. Andreani, D. Grow. Virtual Fixtures for Tip-Over Stability of Teleoperated Mobile Manipulators. Demonstration and poster in *IEEE Haptics Symposium*, Houston, Texas, February 2014.

C. Frederick, J. Lee, and D. Grow. Design and Construction of a Scale Test Bed for Testing Smart EOD Robot Control. In *New Mexico AMP Student Research Conference*, Las Cruces, NM, October 2012.

N. Bhanpuri, D. Grow, A. Okamura, A. Bastian. Can cerebellar dysmetria be explained by an incorrect internal model of limb dynamics? In *Society for the Neural Control of Movement Conference*, Waikoloa, HI, May 2009.

D. Grow, M. Wu, M. Locastro, S. Arora, A. Bastian, and A. Okamura. Haptic Simulation of Elbow Joint Spasticity. In *16th Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, Reno, NV, March 2008.

D. Grow, L. Verner, and A. Okamura. Educational Haptics (with accompanying demonstration). In *AAAI 2007 Spring Symposium - Robots and Robot Venues: Resources for AI Education*, Stanford, CA, March 2007.

INVITED PRESENTATIONS Why Math Matters in Robotics, Eastern New Mexico University – Roswell, March 24, 2014.

Student chapter of American Society of Mech. Eng., NMT, Socorro, NM, March 3, 2014.

UNM Bioengineering Seminar, Albuquerque, NM, August 28, 2013.

ICRA Workshop on Human Robot Interaction, Karlsruhe, Germany, May 10, 2013.

Communication in Engineering, NMT, Socorro, NM, January 30, 2013.

Human Factors in Science and Engineering, NMT, Socorro, NM, November 16, 2012.

Communication in Engineering, NMT, Socorro, NM, February 1, 2012.

Student chapter of American Society of Mech. Eng., NMT, Socorro, NM, October 25, 2011.

Department of Mechanical Engineering, NMT, Socorro, NM, September 6, 2011.

General Dynamics Robotic Systems, Westmister, MD, July 12, 2011.

Intuitive Surgical, Sunnyvale, CA, June 23, 2011.

Department of Mechanical Engineering, NMT, Socorro, NM, July 7, 2011.

Weapons and Systems Engineering, US Naval Academy, Annapolis, MD, February 10, 2011.

ICRA Workshop on Softening Rehabilitation Robotics, Anchorage, AK, May 3, 2010.

JHMI Sensorimotor Research Day, Baltimore, MD, December 7, 2009.

AAAI Spring Symposium Series, Stanford, CA, March 26, 2007.

IEEE VR2006, Washington D.C., March 25, 2006.

ITR Summit Meeting, University of Utah, July 2005.

Michael J. Hargather

Assistant Professor of Mechanical Engineering, New Mexico Tech

Research Scientist, Energetic Materials Research and Testing Center (EMRTC)

New Mexico Tech, 120 Weir Hall
801 Leroy Place
Socorro, New Mexico 87801

email: mjh@nmt.edu
website: www.nmt.edu/mjh
phone: 575-835-5326

EDUCATION **Doctor of Philosophy in Mechanical Engineering**

- Pennsylvania State University, May 2008
- Dissertation: *Scaling, characterization, and application of gram-range explosive charges to blast testing of materials*
- Advisor: Dr. Gary Settles

Bachelor of Science in Mechanical Engineering, with Honors, Minor in Physics

- Penn State Erie, The Behrend College, May 2004
- Grade Point Average: 3.81
- Honors Thesis: *Molecular dynamics simulation of magnetic nanoparticles in a fluid*
- Honors Research Advisor: Dr. G. William Baxter
- Senior Design Project: *Natural gas pipeline flow regulator*
- Design Advisor: Dr. James Sonnenmeier
- Summer abroad, University College of Northampton, 2003

ACADEMIC	Assistant Professor, New Mexico Tech	Aug. 2012 – present
EMPLOYMENT	Research Scientist, Energetic Materials Research and Testing Center	Sept. 2013 – present
HISTORY	Visiting Assistant Professor, New Mexico Tech	Jan. 2012 – July 2012
	Research Associate, PSU Exp. and Comp. Convection Laboratory	Aug. 2011 – Dec. 2011
	Research Associate, Penn State Gas Dynamics Laboratory	June 2008 – July 2011
	Research Assistant, Penn State Gas Dynamics Laboratory	Aug. 2004 – May 2008
	Physics Laboratory Instructor, Penn State Erie	Aug. 2002 – May 2004

TEACHING **Assistant Professor**, Mechanical Engineering, New Mexico Tech

EXPERIENCE	• AE 417 – Aerospace Propulsion	Fa 2014
	• ES 111 – Introduction to Programming	Fa 2013, Sp 2015
	• ES 216 – Fluid Dynamics	Fa 2012
	• ES 347 – Thermodynamics	Sp 2013, Fa 2013, Fa 2014, Fa 2015
	• EXPL 189L – Introduction to Pyrotechnics Laboratory	Sp 2015
	• MENG 189 – Introduction to Programming for Mechanical Engineers	Sp 2014
	• MENG 189 – Aerospace LLC	Sp 2015
	• MENG 351L – Fluid-Thermal Sciences Laboratory	Sp 2014, Fa 2014
	• MENG 431 – Fluid Thermal System Design	Sp 2013, Sp 2014, Sp 2015
	• MENG 560 – Combustion	Fa 2012
	• MENG 585 – Graduate Research Seminar	Fa 2012
	• MENG 586 / AE 491 – Intro. to Digital Image Processing	Fa 2015

Visiting Assistant Professor, Mechanical Engineering, New Mexico Tech

- ES 347 – Thermodynamics Su 2012
- ES 350 – Heat and Mass Transfer Sp 2012
- MENG 585 – Graduate Research Seminar Sp 2012

TEACHING
EXPERIENCE
(CONTINUED)

Instructor, Mechanical and Nuclear Eng. Dept., Pennsylvania State University

- ME 320 – Fluid Dynamics Fa 2012, Fa 2008
- ME 420 – Compressible Flow I Sp 2011
- ME 520 – Compressible Flow II Fa 2010
- ME 300 – Engineering Thermodynamics Sp 2009
- Developer for a new graduate-level experimental methods course Su 2011

Graduate Teaching Fellowship, Mechanical and Nuclear Eng. Dept., Pennsylvania State University (faculty mentor: Dr. Eric Marsh)

- ME 201 – Introduction to Thermal Science Fa 2007, Sp 2008

Laboratory Instructor, Physics Department, Penn State Erie

- PHYS 211L – Mechanics Sp 2003
- PHYS 212L – Electricity and Magnetism Fa 2002, Fa 2003, Sp 2004

Student evaluations are available for all courses taught

RESEARCH
FUNDING

My research focuses on the development and application of optical techniques to the study of high-speed compressible flows and explosions. My expertise is as an experimental fluid dynamicist, with specialties in optical diagnostics including schlieren and shadowgraph flow visualization, high-speed imaging, explosive characterization, and rocket propulsion.

Currently funded proposals

- Principal Investigator, “Experimental Investigation of Turbulent Mixing in Thermite Explosions”, Defense Threat Reduction Agency, **Young Investigator Program (YIP)**, 3 years, \$300,000, Sept. 2014 – Sept. 2017
- Principal Investigator, “Propulsion Technology: Rocket Test Stand Design and Implementation”, Sandia National Laboratories, 3 years, \$120,000, Jan. 2014 – Sept. 2016
- Principal Investigator, “Schlieren imaging of battery failures”, Office of Naval Research, 6 months, \$40,000, June 2015 – Dec. 2015
- Co-Principal Investigator (PI: Dr. Sivaram Gogineni), “Multi-camera BOS imaging for arena test measurement”, Air Force SBIR with Spectral Energies, LLC, 9 months, \$150,000 (\$46,000 to NMT), June 2015 – Feb. 2016
- Principal Investigator, “Additive manufacturing for rocket motors”, Los Alamos National Laboratory, 3 months, \$20,000, July 2015 – Sept. 2015

Previously funded proposals

- Principal Investigator, “Experimental rocket motor launch testing”, Los Alamos National Laboratory, 1 month, \$11,500, 2014
- Co-Principal Investigator (PI: Dr. Sivaram Gogineni), “Stereoscopic retroreflective shadowgraph system for warhead characterization”, Navy SBIR with Spectral Energies, LLC, 6 month Phase 1, \$75,000 (\$25,000 to NMT), 2014
- Principal Investigator, “Focusing schlieren investigation of a spray flow”, Spectral Energies, LLC, 4 months, \$7,500, 2013
- Principal Investigator, “Retroreflective shadowgraph system design”, Sandia National Laboratories, 4 months, \$33,000, 2013
- Principal Investigator, “High-speed shadowgraph imaging of shaped-charge jet formation”, Jet Research Center, 8 months, \$35,000, 2012

RESEARCH
FUNDING
(CONTINUED)**Previously funded proposals (continued)**

- Principal Investigator, “Multi-scale HME characterization and scaling analysis”, Sandia National Laboratories, 1 year, \$60,000, 2012
- Co-Principal Investigator (PI: Dr. Karen Thole), “1X scale heat transfer characterization with porous coupons”, United Technologies Pratt & Whitney, 6 months, \$70,000, 2011
- Co-Principal Investigator (PI: Dr. Gary Settles), “Schlieren based seedless PIV for high frequency cavity flow control applications in large scale wind tunnel facilities”, Air Force SBIR Phase II, \$315,000, 2009-2010
- Co-Principal Investigator (PI: Dr. Gary Settles), “Schlieren system upgrade for the Trisonic Gasdynamics Facility”, Air Force Research Laboratory, 9 months, \$50,000, 2009
- Research Collaborator (PI: Dr. Jim Runt), “Elastomeric polymer-by-design to protect the warfighter against traumatic brain injury by diverting the blast induced shock waves from the head”, Office of Naval Research, 3 year, \$2,200,000, 2009-2012 (participated until December 2011)

INDUSTRIAL
RESEARCH AND
CONSULTING

President, Hargather Imaging Technologies, LLC, 2015 – present
Consultant, nSight, Inc., 2012
Consultant, Aerolab LLC, 2010-2011
Consultant, Intertek, 2008
Summer Intern, Xerox Corporation, Su 2002, Su 2003, Su 2004

PEER-
REVIEWED
JOURNAL
PUBLICATIONS

- [1] Craven, B. A., Hargather, M. J., Volpe, J. A., Frymire, S. P., Settles, G. S., Design of a high-throughput chemical trace detection portal that samples the aerodynamic wake of a walking person, *IEEE Sensors*, 14:1852-1866, 2014
- [2] Hargather, M. J., Background-oriented schlieren diagnostics for large-scale explosive testing, *Shock Waves*, 23:529-536, 2013
- [3] Hargather, M. J., Settles, G. S., Gogineni, S., Optical diagnostics for characterizing a transitional shear layer over a supersonic cavity, *AIAA Journal*, 51:2977-2982, 2013
- [4] Young, R. M., Hargather, M. J., Settles, G. S., Shear stress and particle removal measurements of a round turbulent air jet impinging normally upon a planar wall, *Journal of Aerosol Science*, 62:15-25, 2013
- [5] Fulghum, M. R., Hargather, M. J., Settles, G. S., An integrated impactor/detector for a high-throughput explosive trace detection portal, *IEEE Sensors*, 13:1252-1258, 2013
- [6] Svingala, F. R., Hargather, M. J., Settles, G. S., Optical techniques for measuring the shock Hugoniot using ballistic projectile and high-explosive shock initiation, *International Journal of Impact Engineering*, 50:76-82, 2012
- [7] Hargather, M. J., Settles, G. S., A comparison of three modern quantitative schlieren techniques, *Optics and Lasers in Engineering*, 50:8-17, 2012
- [8] Hargather, M. J., Settles, G.S., Background-oriented schlieren visualization of heating and ventilation flows: HVAC-BOS, *HVAC&R Research*, 17(5):771-780, 2011
- [9] Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Seedless velocimetry measurements by schlieren image velocimetry, *AIAA Journal*, 49(3): 611-620, 2011
- [10] Hargather, M. J., Staymates, M. E., Madalis, M. J., Smith, D. J., Settles, G. S., The internal aerodynamics of cargo containers for trace chemical sampling, *IEEE Sensors Journal*, 11(5): 1184-1193, 2011

 PEER-
 REVIEWED
 JOURNAL
 PUBLICATIONS
 (CONTINUED)

- [11] Grujicic, M., He, T., Pandurangan, B., Svingala, F. R., Settles, G. S., Hargather, M. J., Experimental characterization and material-model development for microphase-segregated polyurea: An overview, *Journal of Materials Engineering and Performance*, 21 (1): 2-16, 2011
- [12] Hargather, M. J., Settles, G. S., Madalis, M. J., Schlieren imaging of loud sounds and weak shock waves in air near the limit of visibility, *Shock Waves*, 20(1): 9-17, 2010
- [13] Hargather, M. J., Settles, G. S., Natural-background-oriented schlieren imaging, *Experiments in Fluids*, 48: 59-68, 2010
- [14] Hargather, M. J., Settles, G. S., Laboratory-scale techniques for the measurement of a material response to an explosive blast, *International Journal of Impact Engineering*, 36: 940-947, 2009
- [15] Hargather, M. J., Settles, G. S., Retroreflective shadowgraph technique for large-scale flow visualization, *Applied Optics*, 48 (22): 4449-4457, 2009
- [16] Hargather, M. J., Settles, G. S., Optical measurement and scaling of blasts from gram-range explosive charges, *Shock Waves*, 17: 215-223, 2007

 TECHNICAL
 CONFERENCE
 PUBLICATIONS

- [1] Youngblood, S. H., Hargather, M. J., Grubelich, M. C., Saul, W. V., Computational modeling of a liquid nitrous oxide and ethanol fueled rocket engine, *JANNAF 46th Combustion, 34th Airbreathing Propulsion, 34th Exhaust Plume and Signatures, 28th Propulsion Systems Hazards Joint Subcommittee Meeting*, 2014
- [2] Hargather, M. J., Canafax, N. B., Stereoscopic retroreflective shadowgraph system for warhead characterization, *JANNAF 46th Combustion, 34th Airbreathing Propulsion, 34th Exhaust Plume and Signatures, 28th Propulsion Systems Hazards Joint Subcommittee Meeting*, 2014
- [3] Hargather, M. J., Hussan, S., Quinlin, M., Jacomb-Hood, T., Francis, Z., Seneca, C., Fernando, R., Fluid dynamics dimensional analysis take-home experiment using paper airplanes, *ASEE Annual Conference*, 2013
- [4] Hargather, M. J., Thole, K. A., Characterization of flow through porous metals, *ASME Turbo Expo*, paper GT2013-94945, 2013
- [5] Svingala, F. R., Hargather, M. J., Settles, G. S., Modern optical methods for determining the shock Hugoniot of transparent solids, *28th International Symposium on Shock Waves*, 2011
- [6] Hargather, M. J., Settles, G. S., Recent developments in schlieren and shadowgraphy, *27th AIAA Aerodynamic Measurement Technology and Ground Testing Conference*, paper AIAA-2010-4206, 2010
- [7] Hargather, M. J., Settles, G. S., Background-oriented schlieren visualization of heating and ventilation flows: HVAC-BOS, *14th International Symposium on Flow Visualization*, 2010
- [8] Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Gogineni, S., Focusing-schlieren PIV measurements of a supersonic turbulent boundary layer, *47th AIAA Aerospace Sciences Meeting*, paper AIAA-2009-69, 2009
- [9] Hargather, M. J., Settles, G. S., Dreibelbis, L. J., Liebner, T. J., Natural-background-oriented schlieren imaging, *13th International Symposium on Flow Visualization*, 2008
- [10] Settles, G. S., Hargather, M. J., Madalis, M. J., Schlieren imaging of loud sounds and weak shock waves in air near the limit of visibility, *13th International Symposium on Flow Visualization*, 2008
- [11] Hargather, M. J., Settles, G. S., Gatto, J. A., Gram-range explosive blast scaling and associated materials response, *26th International Symposium on Shock Waves*, 2007

-
- TECHNICAL
CONFERENCE
PUBLICATIONS
(CONTINUED)
- [12] Biss, M. M., Settles, G. S., Hargather, M. J., Dodson, L. J., Miller, J. D., High-speed digital shadowgraphy of shock waves from explosions and gunshots, *26th International Symposium on Shock Waves*, 2007
 - [13] Hargather, M. J., Settles, G. S., Gatto, J. A., Full-scale optical experiments on the explosive failure of a ULD-3 air cargo container, *4th International Aviation Security Technology Symposium*, 2006
 - [14] Hargather, M. J., Settles, G. S., Gatto, J. A., Optical measurement, characterization, and scaling of blasts from gram-range explosive charges, *4th International Aviation Security Technology Symposium*, 2006
- INVITED
TECHNICAL
PRESENTATIONS
- 1. Shock wave visualization and measurement using the Background Oriented Schlieren (BOS) technique, presented at Sandia National Laboratories, June 2014
 - 2. Quantitative flow visualization techniques for compressible flow experiments, presented at Sandia National Laboratories, April 2014
 - 3. Optical measurement of airblast shock wave pressures, presented at Eglin Air Force Base, March 2014
 - 4. Michael Faraday's The Chemical History of a Candle, presented in the New Mexico Tech Mechanical Engineering Graduate Seminar, September 2012
 - 5. Laboratory-scale explosive research, presented at the French-German Research Institute of Saint-Louis, June 2009
- TECHNICAL
CONFERENCE
PRESENTATIONS
- 1. Hargather, M. J., Armstrong, C., Analysis of shock wave propagation from explosives using computational simulations and artificial schlieren imaging, *67th APS Division of Fluid Dynamics Meeting*, 2014
 - 2. Hargather, M. J., Canafax, N. B., Explosive-driven shock wave interaction with a propane flame, *67th APS Division of Fluid Dynamics Meeting*, 2014
 - 3. Smith, J. L., Youngblood, S. H., Hargather, M. J., New applications of focusing schlieren imaging, *67th APS Division of Fluid Dynamics Meeting*, 2014
 - 4. Tobin, J., Hargather, M. J., Quantitative schlieren measurement of shock wave pressure profile, *66th APS Division of Fluid Dynamics Meeting*, 2013
 - 5. Romo, C. P., Hargather, M. J., Background-oriented schlieren measurement of shock wave pressure profile, *66th APS Division of Fluid Dynamics Meeting*, 2013
 - 6. Hargather, M. J., Rockwell, O., Characterization of a magnetohydrodynamic (MHD) shock sensor using schlieren imaging, *66th APS Division of Fluid Dynamics Meeting*, 2013
 - 7. Hargather, M. J., Optical measurement of airblast shock wave parameters, *Shock and Vibration Symposium*, 2013
 - 8. Hargather, M. J., Hussan, S., Quinlin, M., Jacomb-Hood, T., Francis, Z., Seneca, C., Fernando, R., Fluid dynamics dimensional analysis take-home experiment using paper airplanes, *ASME Annual Conference*, 2013
 - 9. Hargather, M. J., Thole, K. A., Characterization of fluid flow through porous metals, *ASME Turbo Expo*, 2013
 - 10. Hargather, M. J., Settles, G. S., High-volume sampling for explosive trace detection, *Trace Explosives Detection Workshop*, 2011
 - 11. Hargather, M. J., Settles, G. S., Laboratory-scale blast testing and research, *Gordon Research Conference, Energetic Materials*, 2010
 - 12. Hargather, M., J., Settles, G. S., Recent developments in schlieren and shadowgraphy, *27th AIAA Aerodynamic Measurement Technology and Ground Testing Conference*, 2010

- TECHNICAL
CONFERENCE
PRESENTATIONS
(CONTINUED)
13. Hargather, M. J., Settles, G. S., Modern quantitative schlieren techniques, *63rd APS Division of Fluid Dynamics Meeting*, 2010
 14. Hargather, M. J., Lawson, M. J., Settles, G. S., The aerodynamics of canine olfaction, *Gordon Research Conference, Detecting Illicit Substances: Explosives and Drugs*, 2009
 15. Hargather, M. J., Lawson, M. J., Settles, G. S., Weinstein, L. M., Gogineni, S., Focusing-schlieren PIV measurements of a supersonic turbulent boundary layer, *47th AIAA Aerospace Sciences Meeting*, 2009
 16. Hargather, M. J., Lawson, M. J., Settles, G. S., Schlieren velocimetry of turbulent flows, *38th AIAA Fluid Dynamics Conference*, 2008
 17. Hargather, M. J., Settles, G. S., Background-oriented schlieren (BOS): Techniques and applications for multi-scale flow visualization and measurement, *61st APS Division of Fluid Dynamics Meeting*, 2008
 18. Hargather, M. J., Settles, G. S., A midsummer-night's shock wave, *60th APS Division of Fluid Dynamics Meeting*, 2007
 19. Hargather, M. J., Settles, G. S., Small-scale materials blast testing using gram-range explosives and air-shock loading, *59th APS Division of Fluid Dynamics Meeting*, 2006
 20. Hargather, M. J., Settles, G. S., Determining the TNT equivalence of gram-sized explosive charges using shock-wave shadowgraphy and high-speed video recording, *58th APS Division of Fluid Dynamics Meeting*, 2005

TECHNICAL
WORKSHOP
LEADERSHIP

Founder and Lead Instructor, High-speed digital imaging techniques for blast and impact measurement workshop, June 2014, June 2015

Instructor, FEMA Science of Disasters short course, May 2013, May 2014, May 2015

TECHNICAL
WORKSHOP
PARTICIPATION

Rocket Test Group Meeting, China Lake, California, Dec. 2014

Trace Explosives Sampling for Security Applications, Boston, Massachusetts, Aug. 2014

Trace Explosives Detection Workshop, Baltimore, Maryland, Apr. 2010.

Counter IED Technology Assessment Workshop, US DHS, Nov. 2009

Explosive Particle Sampling Workshop, US DHS Transportation Security Lab., Feb. 2009

Fundamentals of Explosives Short Course, University of Rhode Island, May 2008

STUDENT
ADVISING

Graduate Research Advising

- James Anderson, MS in Mechanical Engineering, Aug. 2015 – May 2017 (expected)
- Kyle Winter, MS in Mechanical Engineering, Aug. 2015 – May 2017 (expected)
- Joshua Smith, MS in Mechanical Engineering, Aug. 2014 – May 2016 (expected)
- John Locke, PhD in Mathematics (Co-Advisor), Aug. 2015 – May 2017 (expected)
- Stewart Youngblood, MS in Mechanical Engineering, Aug. 2013 – Sept. 2015
- Michael Shattuck, MS in Mechanical Engineering, Mar. 2012 – Jan. 2015
- Cynthia Romo, MS in Mechanical Engineering, Aug. 2012 – Dec. 2014
- Jesse Tobin, MS in Mechanical Engineering, Aug. 2012 – Aug. 2014
- Megan Tribble, MS in Mechanical Engineering, Aug. 2012 – May 2014

STUDENT
ADVISING
(CONTINUED)**Current Undergraduate Research Advising**

- F. Austin Mier, BS in Mechanical Engineering, Jan. 2015 – May 2016 (expected)
- Jeff Phillip, BS in Mechanical Engineering, Jan. 2015 – Dec. 2015 (expected)
- Isaiah Ware, BS in Mechanical Engineering, Aug. 2015 – Dec. 2015 (expected)
- Rudy Morales, BS in Mechanical Engineering, Sept. 2015 – May 2016 (expected)
- Caralyn Coultas-McKinney, BS in Chemical Engineering, Sept. 2015 – May 2016 (expected)

Faculty Advisor for Mechanical Engineering Design Teams

- Portable Drop Hammer Fa 2014 – present
- Energetic Materials 3D Printer Fa 2015 – present
- Explosive Vapor Detection Fa 2014 – Sp 2015
- Rocket Engine Test Stand Fa 2013 – Sp 2014
- TATP Remote Synthesis Fa 2013 – Sp 2014
- Refrigeration Demonstration Fa 2013 – Fa 2014
- Sounding Rocket Fa 2012 – Sp 2014
- Battery Crush Tester Sp 2012 – Sp 2013
- Sacred Power Solar Collector Sp 2012 – Sp 2013

Academic Advisor for more than 50 undergraduate Mechanical Engineering students

Member of more than 10 graduate committees at New Mexico Tech

PROFESSIONAL
MEMBERSHIPS

American Society of Mechanical Engineers, member 2001 – present
President of Penn State Erie ASME Student Chapter, 2003
 American Physical Society, member 2005 – present
 American Institute of Aeronautics and Astronautics, member 2008 – present
 American Society for Engineering Education, member 2010 – present
 National Association of Rocketry, member 2015 – present

SELECTED
MEDIA
APPEARANCES

Los Alamos National Lab youtube channel, *Novel Rocket Design Flight Tested* Oct. 2014
 Discovery Science Channel show *World's Strangest: Explosions*, June 2014
 NPR Science Article "What does sound look like", Apr. 2014
 PBS Nova show *Cold Vase JFK*, Nov. 2013
 PBS Nova show *Manhunt-Boston Bombers*, May 2013

UNIVERSITY
SERVICE

Member of Regents Faculty Conference Committee, 2013 – present
 Member of Computing on Campus Committee, 2015 – present
Organizer of Research Coffee Hour, 2013-present
 Student Living Learning Community course development and teaching, 2013 – 2015
 Member of Collaborative Senior Capstone Course Development Committee, 2014 – present
 Member of faculty search committee for Chemistry Department, 2014 – 2015
 Member of NMT 2015 – 2020 Strategic Planning Committee
Co-Chair of Community of Scholars Task Force, 2013 – 2014
 Member of Space Allocation Committee, 2012 – 2014
 Regularly attend Faculty Senate meetings at New Mexico Tech

PEER *Experiments in Fluids*
REVIEWER *International Journal of Impact Engineering*
Flow Measurement and Instrumentation
Journal of Aerosol Science and Technology
Shock Waves
Propellants, Explosives, Pyrotechnics
Measurement Science and Technology
Ocean Engineering
Aerospace Science and Technology

Department of Mechanical Engineering
New Mexico Institute of Mining and Technology
801 Leroy Place Socorro, NM 87801

☎ (217)621.8272

☎ (575)835.5036

✉ jamiek@nmt.edu

Jamie Kimberley

Education

- 2008 **Ph.D., Aerospace Engineering**, *University of Illinois, Urbana–Champaign.*
- 2002 **M.S., Theoretical & Applied Mechanics**, *University of Illinois, Urbana–Champaign.*
- 1999 **B.S., Mechanical Engineering**, *State University of New York, Binghamton.*

Appointments

- August 2012–Present **Department of Mechanical Engineering**, *Assistant Professor*, New Mexico Institute of Mining and Technology.
- August 2013–Present **Energetic Materials Research & Testing Center**, *Research Scientist*, New Mexico Institute of Mining and Technology.
- February 2008–August 2012 **Department of Mechanical Engineering**, *Postdoctoral Fellow*, Johns Hopkins University.

Awarded Research Proposals

- Co-Pi: *Glovebox Fire Suppression System Fire Testing*, Los Alamos National Laboratory, 2015
- Co-PI: *Impact Testing of Polycarbonate Containment Panels*, Love Engineering Systems, 2014
- PI: *Dynamic Microscale Tensile Testing of Magnesium*, Army Research Office/Center for Materials Under Extreme Dynamic Environments, 2013-2015
- PI: *High-Speed Visualization Instrumentation for Dynamic Microscale Material Testing*, Army Research Office/Center for Materials Under Extreme Dynamic Environments, 2012
- Science PI (postdoc): *Dynamic Failure Mechanics Applied to Disruption and Cratering Problems*, NASA Planetary Geology and Geophysics, 2012-2014

Journal Publications

James David Hogan, Jamie Kimberley, Kavan Hazeli, Jeffrey Plescia, and KT Ramesh. Dynamic behavior of an ordinary chondrite: The effects of microstructure on strength,

failure and fragmentation. *Icarus*, 260:308–319, 2015.

KT Ramesh, James D Hogan, Jamie Kimberley, and Angela Stickle. A review of mechanisms and models for dynamic failure, strength, and fragmentation. *Planetary and Space Science*, 107:10–23, 2015.

J Kimberley, K. T. Ramesh, and N. P. Daphalapurkar. A scaling law for the dynamic strength of brittle solids. *Acta Materialia*, 61:3509–3521, 2013.

Andrew L. Tonge, Jamie Kimberley, and K.T. Ramesh. The mechanism of compressive unloading failure in single crystal quartz and other brittle solids. *International Journal of Solids and Structures*, 49(26):3923 – 3934, 2012.

J. Kimberley and K. T. Ramesh. Dynamic response of transparent ceramic $MgAl_2O_4$ spinel. *Scripta Materialia*, 65(9):830–833, 2011.

Jamie Kimberley and K. T. Ramesh. The dynamic strength of an ordinary chondrite. *Meteoritics & Planetary Science*, 46(11):1653–1669, 2011.

J. Kimberley, J. Lambros, I. Chasiotis, J. Pulskamp, R. Polcawich, and M. Dubey. A Hybrid Experimental/Numerical Investigation of the Response of Multilayered MEMS Devices to Dynamic Loading. *Experimental Mechanics*, 50(4):527–544, 2010.

J. Kimberley, J. Lambros, I. Chasiotis, J. Pulskamp, R. Polcawich, and M. Dubey. Mechanics of energy transfer and failure of ductile microscale beams subjected to dynamic loading. *Journal of the Mechanics and Physics of Solids*, 58(8):1125–1138, 2010.

J. Kimberley, K. T. Ramesh, and O. S. Barnouin. Visualization of the failure of quartz under quasi-static and dynamic compression. *J. Geophys. Res.*, 115(B8):B08207, 2010.

J. Kimberley, R. S. Cooney, J. Lambros, I. Chasiotis, and N. S. Barker. Failure of au rf-mems switches subjected to dynamic loading. *Sensors and Actuators A: Physical*, 154(1):140–148, 2009.

J. Kimberley, I. Chasiotis, and J. Lambros. Failure of microelectromechanical systems subjected to impulse loads. *International Journal of Solids and Structures*, 45(2):497–512, 2008.

J Kimberley and J Lambros. Dynamic crack kinking from a pmma/homalite interface. *Experimental Mechanics*, 44:158–166, 2004.

Conference Proceedings

Jamie Kimberley and Justin Paul. A miniature tensile kolsky bar for thin film testing. In Bo Song, Daniel Casem, and Jamie Kimberley, editors, *Proceedings of the Society*

for *Experimental Mechanics Conference: Dynamic Behavior of Materials, Volume 1*, pages 221–226. Springer International Publishing, 2015.

J Kimberley and KT Ramesh. Visualization of early stage damage propagation during hypervelocity impacts on brittle materials. In *Procedia Engineering*, volume 58, pages 678–683. Elsevier, 2013.

Andrew L. Tonge, Jamie Kimberley, and K.T. Ramesh. A consistent scaling framework for simulating high rate brittle failure problems. In *Procedia Engineering*, volume 58, pages 692 – 701, 2013.

Invited Seminars

J. Kimberley. Building a better shield: properties and processes for improved armor material development. ASM International Albuquerque chapter meeting, Socorro, NM, February 2015.

J. Kimberley. Strength of stony meteorite samples subjected to various loading states. Conference on Spacecraft Reconnaissance of Asteroid and Comet Interiors (AstroRecon), Tempe, AZ, January 2015.

J. Kimberley. Dynamic tensile response of magnesium: Properties and processes for advanced armor development. Department of Mechanical and Aerospace Engineering, New Mexico State University, Las Cruces, NM, October 2014.

J. Kimberley. The role of experiments in science and engineering. ASME Student Chapter, New Mexico Tech., Socorro, NM, October 2013.

J. Kimberley. Dynamic failure of brittle solids: Properties and processes. Department of Mechanical Engineering, New Mexico Tech., Socorro, NM, August 2012.

J. Kimberley. Dynamic failure of brittle solids: Properties and processes. Weapons and Materials Research Directorate, Army Research Lab, Aberdeen, MD, June 2012.

J. Kimberley. The dynamic failure of meteorites: Implications for asteroid impacts. Department of Mechanical Engineering, New Mexico Tech., Socorro, NM, June 2012.

J. Kimberley. Dynamic failure: Properties and processes. Department of Mechanical Engineering, University of California–Riverside, Riverside, CA, March 2012.

J. Kimberley. High strain-rate testing of extraterrestrial materials. Department of Mechanical, Materials and Aerospace Engineering, University of Central Florida, Orlando, FL, April 2011.

J. Kimberley. Big problems: Rate effects in asteroid impacts. Department of Civil and Environmental Engineering, Vanderbilt University, Nashville, TN, February 2011.

J. Kimberley. Big problems: Rate effects in asteroid impacts. Department of Mechanical Engineering, Clemson University, Clemson, SC, February 2011.

Conference Presentations

J. V. Paul, Jamie Kimberley, and L J Kecskes. Dynamic tensile testing of magnesium foils. Costa Mesa, CA, 2015. Society for Experimental Mechanics.

Jamie Kimberley and Justin Paul. A miniature tensile kolsky bar for thin film testing. Society for Experimental Mechanics Annual Conference, Greenville, SC, June 2014.

J. Kimberley and J. V. Paul. Dynamic tensile testing of magnesium foils. Mach Conference, Annapolis, MD, April 2014.

A.M. Stickle, J. Kimberley, and K. T. Ramesh. The dynamic strength of basalt under general stress states: Experiments for impact model development and validation. Lunar and Planetary Science Conference, The Woodlands, TX, March 2014.

J. Kimberley, K. T. Ramesh, and N. P. Daphalapurkar. A scaled model describing the rate-dependent strength of brittle materials. Shock and Vibration Symposium, Atlanta, GA, November 2013.

J. Kimberley. A dynamic microtensile system for thin film testing. Mach Conference, Annapolis, MD, April 2013.

A.M. Stickle, J. Kimberley, and K. T. Ramesh. Dynamic strength experiments on basalt with applications to cratering on mercury. Lunar and Planetary Science Conference, The Woodlands, TX, March 2013.

J Kimberley and K. T. Ramesh. Visualization of early stage damage propagation during hypervelocity impacts on brittle materials. Hypervelocity Impact Symposium, Baltimore, MD, September 2012.

A. L. Tonge, J. Kimberley, and K. T. Ramesh. A consistent scaling framework for simulating high rate brittle failure problems. Hypervelocity Impact Symposium, Baltimore, MD, September 2012.

J. Kimberley and K. T. Ramesh. Early stage damage propagation in hypervelocity impacts on brittle materials. Society of Experimental Mechanics Annual Conference, Costa Mesa, CA, June 2012.

J. Kimberley and K. T. Ramesh. Real-time observation of early stage damage during hypervelocity impacts into basalt targets. Lunar and Planetary Science Conference, The Woodlands, TX, March 2012.

J. Kimberley, G. Hu, and K. T. Ramesh. A scaled model describing the rate-dependent compressive strength of brittle materials. Society of Experimental Mechanics Annual Conference, Uncasville, CT, June 2011.

A. L. Tonge, J. Kimberley, and K. T. Ramesh. Understanding damage growth under global compression. Society of Experimental Mechanics Annual Conference, Uncasville, CT, June 2011.

J. Kimberley, K. T. Ramesh, O. S. Barnouin, and C. M. Ernst. A size dependent scaling law based on the rate dependent strength of rocky bodies. Lunar and Planetary Science Conference, The Woodlands, TX, March 2011.

J. Kimberley, G. Hu, and K. T. Ramesh. A scaled model describing the rate-dependent compressive strength of brittle materials. 35th International Conference and Exposition on Advanced Ceramics and Composites, Daytona Beach, FL, January 2011. American Ceramics Society.

J. Kimberley, K. T. Ramesh, J. W. McCauley, and P. Patel. Dynamic compressive strength of transparent polycrystalline spinel ($MgAl_2O_4$). Society of Experimental Mechanics Annual Conference, Uncasville, CT, 2011.

J. Kimberley and K. T. Ramesh. Rate effects in the failure strength of extraterrestrial materials. Society of Experimental Mechanics Annual Conference, Indianapolis, IN, June 2010.

J. Kimberley, K. T. Ramesh, O. S. Barnouin, and Ernst C. M. Dynamic strength measurements of 15 ordinary chondrite MacAlpine hills 88118. Lunar and Planetary Sciences Conference, The Woodlands, TX, March 2010.

J. Kimberley, K. T. Ramesh, J. W. McCauley, and P. Patel. Dynamic compressive strength of micron and sub-micron grain polycrystalline spinel. 34th International Conference and Exposition on Advanced Ceramics and Composites, Daytona Beach, FL, January 2010. American Ceramics Society.

J. Kimberley and K. T. Ramesh. Failure of quartz crystals under dynamic compression. Society of Experimental Mechanics Annual Conference, Albuquerque, NM, June 2009.

J. Kimberley, K. T. Ramesh, O. S. Barnouin-Jha, C. M. Ernst, and P. K. Swaminathan. Visualization of high- and low-rate compressive failure of quartz. Lunar and Planetary Sciences Conference, The Woodlands, TX, March 2009.

J. Kimberley, J. Lambros, I. Chasiotis, J. Pulskamp, and R. Polcawich. High loading-rate response of Au microbeams. Society for Engineering Science annual conference, Urbana, IL, October 2008.

K. T. Ramesh, J. Kimberley, O. S. Barnouin-Jha, C. M. Ernst, and P. K. Swaminathan. Advances in experimental fracture mechanics: Applications to fragmentation and cratering. Asteroids Comets and Meteors, Baltimore, MD, July 2008.

J. Kimberley, J. Lambros, I. Chasiotis, J. Pulskamp, and R. Polcawich. Dynamic failure of multilayer MEMS at intermediate loading rates. Society for Engineering Science annual conference, Urbana, IL, October, 2008.

J. Kimberley, I. Chasiotis, and J. Lambros. Experimental Investigation of Failure of MEMS Subject to Stress Wave Loading. 17th US Army symposium on solid mechanics, Baltimore, MD, April 2007.

J. Kimberley, R. Cooney, J. M. Minary, I. Chasiotis, and J. Lambros. Dynamic failure of MEMS: Experiments and simulations. ASME winter annual meeting, Chicago IL, November 2006.

J. Kimberley, I. Chasiotis, and J. Lambros. Dynamic failure of microelectromechanical systems. SEM conference and exposition, St. Louis, MO, June 2006.

H. Padilla, J. Kimberley, J. Lambros, A. Beaudoin, and I. Robertson. Effect of twinning on the dynamic response of metals. SEM conference and exposition, Portland, OR, June 2005.

J. Kimberley and J. Lambros. High strain rate response of metals investigated using laser-pulse loading. SEM conference and exposition, Costa Mesa, CA, June 2004.

J. Kimberley and J. Lambros. Experimental investigation of an interfacial crack under dynamic mixed mode loading. ASME winter annual meeting, Washington DC, November 2003.

J. Kimberley and J. Lambros. Crack kinking from a dynamically loaded interface. SEM conference and exposition, Charlotte, NC, June 2003.

J. Kimberley and J. Lambros. Interfacial crack kinking under dynamic mixed mode loading. ASME winter annual meeting, New Orleans, LA, November 2002.

Associations

- Society for Experimental Mechanics
- American Society of Mechanical Engineers
- Order of The Engineer

Professional Service

To The Scientific Community

Society for Experimental Mechanics Dynamic Behavior of Materials Technical Division

- Vice Chair: 2014-present
- Secretary: 2012-2014

Symposium organizer:

- Society of Experimental Mechanics Annual Conference, 2012-2014
- 22nd International Workshop on Computational Mechanics of Materials

Reviewer:

- ASME Journal of Vibration and Acoustics
- Meccanica

- Composites Science and Technology
- ASME Journal of Applied Mechanics
- Experimental Mechanics
- Journal of Strain Analysis
- Micro & Nano Letters
- Icarus
- Tectonophysics
- Philosophical Transactions of the Royal Society, A

[To The Department & University](#)

Graduate Program Coordinator:

- NMT Department of Mechanical Engineering: 2014-present

Organizer:

- NMT Department of Mechanical Engineering weekly seminar 2012-2013
- JHU Department of Mechanical Engineering weekly solids seminar: 2008-2009

Link Governor:

- Order of the Engineer: New Mexico Tech. Link: 2013-present

Honors and Awards

- J.O. Smith Excellence in Teaching Award, Department of Theoretical & Applied Mechanics, University of Illinois at Urbana–Champaign: 2001

Teaching Experience

Spring 2015

ES-201: Instructor Statics	<i>New Mexico Institute of Mining and Technology</i>
MENG-421: Instructor Finite Element Analysis & Design	<i>New Mexico Institute of Mining and Technology</i>

Fall 2014

ES-201: Instructor Statics	<i>New Mexico Institute of Mining and Technology</i>
MENG-598: Instructor Impact Dynamics	<i>New Mexico Institute of Mining and Technology</i>

Spring 2014

ES-201: **Instructor**
Statics

New Mexico Institute of Mining and Technology

MENG-421: **Instructor**
Finite
Element
Analysis &
Design

New Mexico Institute of Mining and Technology

Fall 2013

ES-201: **Instructor**
Statics

New Mexico Institute of Mining and Technology

MENG-598: **Instructor**
Impact
Dynamics

New Mexico Institute of Mining and Technology

Summer 2013

ES-201: **Instructor**
Statics

New Mexico Institute of Mining and Technology

Spring 2013

ES-201: **Instructor**
Statics

New Mexico Institute of Mining and Technology

MENG-421: **Instructor**
Finite
Element
Analysis &
Design

New Mexico Institute of Mining and Technology

Fall 2012

ES-201: **Instructor**
Statics

New Mexico Institute of Mining and Technology

MENG-598: **Instructor**
Impact
Dynamics

New Mexico Institute of Mining and Technology

Fall 2010

ME 530.352: **Co-Instructor**
Materials
Selection

Johns Hopkins University

Fall 2000

TAM 224: **Teaching Assistant**
Mechanical
Behavior of
Materials

University of Illinois

- Listed as a teacher ranked as outstanding by students

Summer 2000

TAM 212: **Instructor**
Engineering
Mechanics
II-Dynamics

University of Illinois

- Listed as a teacher ranked as excellent by students

Spring 2000

TAM 212: **Teaching Assistant**
Engineering
Mechanics
II-Dynamics

University of Illinois

- Listed as a teacher ranked as outstanding by students

Fall 1999

TAM 212: **Teaching Assistant**
Engineering
Mechanics
II-Dynamics

University of Illinois

VITA

(As of Feb 2014)

SEOKBIN (BIN) LIM, Ph.D

Associate Professor
Energetic Systems Research Group
Department of Mechanical Engineering
New Mexico Tech
801 Leroy Place, Socorro, NM 87801
Phone: 575 835 6589
Email: lim@nmt.edu

Research Scientist (Joint appointment)
EMRTC (Energetic Materials Research and Testing Center)
New Mexico Tech
801 Leroy Place, Socorro, NM 87801

EXPERTISE

Energetic material science/technology/safety, Shock/tensile
energetic-mechanical systems, Shaped charges (CSCs and LSCs), EFRS.

EDUCATION

- Ph.D. Energetic Material (EM) emphasis, Missouri S&T (formerly University of Missouri-Rolla), Rolla, MO, May 2006
Dissertation title: Investigation of the Blade Formation Process of Linear Shaped Charges
Advisor: Dr. Paul Worsey
- M.S. Energetic Material (EM) emphasis, Missouri S&T (formerly University of Missouri-Rolla), Rolla, MO, Dec 2003
Thesis title: Investigation of the Characteristics of Linear Shaped Charges used in Demolition
Advisor: Dr. Paul Worsey
- B.S. Mechanical Design Engineering. Chungnam National University, South Korea, February 2000

EMPLOYMENT HISTORY

- May 2014 ~ Current Research Scientist, EMRTC (Joint Appointment)
New Mexico Institute of Mining Technology, Socorro, NM
- May 2013 ~ Current Associate Professor (tenured), Department of Mechanical Engineering
New Mexico Institute of Mining Technology, Socorro, NM
- Jan 2008 ~ May 2013 Assistant Professor, Department of Mechanical Engineering
New Mexico Institute of Mining Technology, Socorro, NM
- Aug 2006 ~ Dec 2007 Research Assistant Professor, Department of Mechanical Engineering
New Mexico Institute of Mining Technology, Socorro, NM

TECHNICAL SKILLS

- INSTRUMENTATION: Various types of explosives testing equipment including: EBW detonator systems, Blasting chamber operation, High-speed camera system (millions/sec ranges), Low-speed camera system (thousands/sec ranges), Electronic detonator system (manufactured by Daveyfire Inc.), VISAR (velocity interferometer systems for any reflector), Two-stage light-gas gun operation, etc.
- COMPUTATION: AUTODYN™, LS-Dyna, AutoCAD™, Solidworks™, etc.

CERTIFICATIONS/TRAINING/AWARD AND SCHOLARSHIP

- Rockwell Laser Safety Officer (LSO) Training, Rockwell industries. San Diego, CA, June 5th ~ 8th, 2012
- LS-DYNA™ Advanced Training, Schwer Engineering & Consulting Services. Troy, MI, May 1st ~ 4th, 2012
- LS-DYNA™ Introductory Training, LSTC, Inc. Livermore, CA, July 1st ~ 6th, 2011
- DoD Information Assurance Awareness training, Online training, Jan 2011
- DHS Career Development Grant (CDG) recipient, 2009
- Society of Explosives Engineers Education Foundation, Dr. Persson Scholarship, September 2005

- Certified training on “A primer on explosion effects in the air, water and soil”, 76th Shock and Vibration Symposium, Destin, FL, Oct 31, 2005
- AUTODYN™ Introductory Training, Century Dynamics, Inc. Concord, CA, August 22nd ~ 26th, 2005
- Relief from Federal Explosive Disabilities, Authorized by Bureau of Alcohol, Tobacco, Firearm and Explosives (BATF), February 2005
- Society of Explosives Engineers Education Foundation, Dr. Persson Scholarship, August 2004
- Missouri Limestone Producers Association, MLPA Certified Blaster, since May 2004
- Premiere Pyrotechnics: Lead Pyrotechnician, Trained in NFPA-1123, January 2003
- International PADI, PADI Certified Underwater Rescue Diver, since July 1997

PROFESSIONAL ACTIVITIES and SERVICES

- NMT Tenure review committee, (2013)
- DAPS (4th International Conference on Design and Analysis of Protective Structures): session chair, (2012)
- Mechanical Department Laser Safety Officer (LSO) since summer (2012)
- Paper reviewer: JIMSS (Journal of Intelligent Material Systems and Structures), (2011)
- Paper reviewer: MDPI publication, (2011)
- SMASIS (Smart Materials Adaptive Structures & Intelligent Systems): session chair, (2011)
- Member of International Symposium on Ballistics (ISB), (Since 2011)
- Member of American Society of Naval Engineers (ASNE) (2010)
- Invited editorial board member of ‘International Research Publication House’ (April 2009)
- Co-chair, NMT Distance Education Committee (Oct 2009)
- ISEE mentoring program, committee member (2009 – present)
- U.S. Army Corps of Engineers’ Engineer Research and Development Center’s (ERDC) FY08 Basic Research solicitation proposal peer reviewer (2008)
- International Society of Explosives Engineers (ISEE) educational committee member (2006 – present)
- ISEE Student chapter advisor at New Mexico Tech, (2006 – present)
- Active member of International Society of Explosives Engineers (ISEE) (2000 – present)

COURSE DEVELOPMENT/ INSTRUCTION

- MENG 545 (EXPL 311): Introduction to Explosives Engineering
Introduction to the broad field of explosives science and technology covering the following topics: Basic organic chemistry, decomposition reactions, properties of explosives, thermodynamics of explosives, shock wave theory, detonation theory, initiators, Gurney equations, blast effects and demolition.
- MENG 549 (EXPL 412): Shockwave Propagation
An in-depth study of the propagation of waves in various media. The derivation and application of the Rankine-Hugoniot jump equations. The concept of the rarefaction wave and various wave interactions.
- MENG 550: Advanced Explosives Engineering
The detonation of non-ideal explosives, shaped charge effect and explosively formed projectiles. Explosive welding and experimental methods used in the evaluation of explosives and their applications.
- MENG 553: Numerical Modeling of Detonation
Introduction to the hydrodynamic modeling in explosives application. Numerical methods for modeling shock physics, detonation, and material response. Finite element method and smoothed particle hydrodynamic methods, equation of state and strength models, and numerical fracture and fragmentation.
- MENG 586 (EXPL 418): Special Topic - Shock Physics and Structural Response to Blast
Introduction to the shock physics in air and structural response under strong air blast loading. An understanding of the basic shock propagation behaviors depending on the air properties variation, air blast formation, shock reflection (normal vs. oblique shock), and fundamentals of structural systems and evaluation.
- MENG 586L: Special Topic -Explosives Science and Application Lab
Introduction of the multi-disciplinary fields of engineering hands-on knowledge of explosives including mechanics and applications of explosives. Based on multi-disciplinary areas of engineering of explosives, students can learn more in-depth and hands-on based explosives application and science, providing different levels of achievement, starting with the basic science and moving toward more advanced engineering applications.

ACADEMIC COUNSELING (visiting professor and researcher)

Two foreign national researchers have visited our department under my authority to collaborate the explosives research. I helped them to obtain a visiting visa, and build subsequent research efforts.

- Dr. Yavuz Gezicioglu, visiting professor from Mugla University, Turkey sponsored by The Council of Higher Education of Turkey. June 2011 ~ Aug 2011.
- Ms. Pauline Tabozzi, a military student engineer in the DGA (French Procurement Agency), France. (Lieutenant). April 2012 ~ Sep 2012.

ACADEMIC ADVISING (graduate students)

Full time Ph.D students (as a committee):

1. Dr. Graham Walsh
2. Dr. Yavuz Gezicioglu

Full time MS students (as an advisor with support):

1. Mr. Sean Hamilton (supported from the DHS project). Graduate
2. Mr. Matthew Johnston (supported from the ONR & SNL project): Graduate
3. Mr. Andrew Thompson (supported from the DHS project). Graduate
4. Mr. Brent Meins (supported from the DHS project). Graduate
5. Mr. Jason Phillips (supported from the NSF project). Graduate
6. Mr. Joseph Indeck (supported from the DHS project). Graduate
7. Mr. James Moff (supported from the ONR/SNL project): In progress
8. Mr. Justin Guthrie (supported from the ONR/SNL project): In progress
9. Mr. Calvin Santistevan (supported from the ONR/SNL project): In progress

Full time MS students (as an advisor without support):

1. Mr. Dan Hoff
2. Major. Brett Carey. Graduate
3. Mr. Clay Thompson. Graduate
4. Mr. Jason Roger. Graduate
5. Major. Rich Findlay. Graduate
6. Ms. Alaina Schade
7. Mr. Steven Mathe

Part time MS students, DE students (as a committee or advisor):

1. Mr. James Dodson, In progress
2. Mr. Giannuzzi, Paul, In progress
3. Mr. Davis, Benjamin: Graduated in Dec 2011
4. Mr. Cash, Michael: Current
5. Mr. Peterson, David: Graduated in Jan 2012
6. Mr. Rolfe, George: Current
7. Mr. Williams, Joel: Graduated in Apr 2011
8. Mr. Morris, John: Current
9. Mr. Kenady, Kollin: Current
10. Mr. Cooksey, Rufus: Graduated in Aug 2011
11. Mr. Wilches, Winston: Graduated in Aug 2013
12. Mr. Jeff Smith: Current
13. Mr. Van De Mark: Graduated in May 2012
14. Mr. Davis, Ben: Graduated in Dec 2011
15. Mr. Cooksey, Rufus: Graduated in Aug 2011
16. Ms. Drauschak, Stephenie: Graduated in May 2011
17. Ms. Francois, Elizabeth: Graduated in May 2009
18. etc. (due to their open schedules and class curricula, it is hard to keep track of all students)

RESEARCH ACTIVITIES (As a faculty)

Cumulative funding received as PI from 2008 to 2013: \$737,252

Cumulative funding received as PI and Co-PI from 2008 to 2013: \$937,186

- 10/09-Present Office of Naval Research (ONR) funded “Development of Novel Methodological Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems (Phase I ~ IV)” (Oct, 2009 ~ current). PI

- 06/09-Present Sandia National Laboratory (SNL) funded “An Engineering Design of Linear Shaped Charges Driven by Electro-magnetic Forces (Phase I ~ III)” (June, 2009 ~current). PI
- 09/08-09/12 Department of Homeland Security (DHS) funded “DHS HS-STEM Career Development Grant (CDG): New Mexico Tech Explosives Engineering HS-STEM Program” (Sep, 2008 ~ Sep, 2012, No-cost extended). PI
- 05/08-08/11 National Science Foundation (NSF) funded “Course Curriculum, and Laboratory Improvement (CCLI): Explosives Engineering Laboratory for Undergraduate (EELU)” - Phase I (May, 2008 ~ Aug, 2011). Co-PI
- 05/07-03/08 Development of an innovative excavation (deep drilling) system utilizing exothermic amplification of pulsed electromagnetic power (EAPERD project) - Phase I (Sep, 2007 ~ Mar, 2008, Co-PI), funded by Boyer & Associates, Lombard, IL 60148. Co-PI
- 11/06-05/07 Participated in the preliminary development of military vehicle protection system, (APS: Active Protection System) from incident RPG attack using Linear Shaped Charges technology - Project title: “DARPA iron curtain project”. Consultant

RESEARCH EXPERIENCES (As a graduate research assistant)

- 06/05-08/06 Conceptual development/design of general multi-purpose blast mitigation systems to protect civil structures from incident blast occurrences - Project title: “Development of blast mitigation system for civil structures”, sponsored by Department of Air Force.
- 01/04-05/04 Defined and developed methods for breaching reinforced concrete walls using Linear Shaped Charges - Project title: “Axi-Symmetric Shaped Charge Breaching Tool”, sponsored by Corps of Engineers
- 07/01-05/03 Performed study on Glass Microspheres as Taggants for the Detection and Identification of Explosive Materials, sponsored by BATF Contract : TATF-99-11
- 01/02 Steel structure demolitions using Linear Shaped Charges with a progressive collapse method - Conveyer Structure Demolition, Missouri Limestone Inc., Springfield, MO
- 03/21/02 Participated in steel bridge demolition using Linear Shaped Charges - Sappington Bridge Demolition, Crawford Co, MO - results reported in “Sappington Bridge: An Opportunity for Strengthening Research and Demolition Training” in ISEE (Baird, J., 2003)
- 10/01-03/02 Participated in creating an artificial entrance from the surface into Carroll Cave at a location known as the T-Junction with minimizing any disturbance to the geology and biology of the cave, Camden Co, MO - results reported in “Blasting A New Entrance to Carrol Cave” in ISEE (Bowles, J., et al, 2003)
- 11/01 Participated in steel structure demolitions using Linear Shaped Charges as main cutting devices and electronic detonator systems -Power Plant Ball Mill Demolitions, Ameren Corp. St. Louis, MO

PUBLICATIONS/PROCEEDINGS

1. **Lim, Seokbin.** “Acceleration profile of a flat flyer driven by detonation isentrope” Propellants Explosives Pyrotechnics, 38(3), 410-418, 2013
2. **Lim, Seokbin,** “Jet Velocity Profile of Linear Shaped Charges Based on the Arced Liner” Journal of Energetic Materials, 31(4), 239~250, 2013
3. Matthew Johnston & **Seokbin Lim** “Numerical observation of the jet flight patterns of linear shaped charges”. Appl. Sci. 2(3), 629~640, 2012
4. **Lim, Seokbin,** “Steady State Equation of Motion of a Linear Shaped Charges Liner” International Journal of Impact Engineering, 44, 10~16, 2012
5. **Lim, Seokbin,** “A Steady State Analytical Equation of motion of LSCs Jet Based on the Modification of Birkhoff Theory” Appl. Sci., 2(1), 35~45, Dec. 2011. (Retracted and Review in progress)
6. Indeck, J. and Thompson, A. and **Lim, Seokbin,** “Numerical Analysis of Damage Propagation for Shaped Charge Jet Impacts into a Concrete Target” I-Manager’s Journal on Civil Engineering, Vol. 1. No 2. 55~62, Mar 2011
7. **Seokbin Lim,** “Review of Equations of Motion of Linear Shaped Charges Liner”, 40th Annual Conference in Explosives and Blasting Technique. Feb 2014
8. **Seokbin Lim,** Liner Collapse & Jetting Process of Linear Shaped Charges (LSCs), 84th Shock and Vibration Symposium, Atlanta, GA, Nov 2013

9. **Seokbin Lim**, “Acceleration profile of a flat flyer driven by detonation product isentrope” 83rd Shock and Vibration Symposium, New Orleans, LA, Nov 2012
10. Indeck, J and **Lim, Seokbin**, “Damage Propagation in a Concrete Block Under the Shaped Charge Jet Impact” 4th International Conference on Design and Analysis of Protective Structures, Jeju, South Korea, May 2012.
11. **Lim, Seokbin**, “A Steady State LSCs Liner Collapse Model Based on Birkhoff Theory” Proceedings of the ASME 2011 Conference on Smart Materials Adaptive Structures & Intelligent Systems (SMASIS), Scottsdale, AZ, Sep 2011.
12. Brent Meins (Advisor: **Lim, Seokbin**), “Novel structural Control for Multi-Hazard Protection” DHS (Department Homeland Security) 5th Annual University Network Summits, D.C. Mar 2011.
13. Indeck, J., Thompson, A., **Lim, Seokbin**, “Penetration Analysis of a Shaped Charge Jet into a Concrete Target” Proceedings of the 36th Annual conference of ISEE, San Diego, Feb 2011.
14. C. R. Findlay and **Lim, Seokbin**. “Preliminary Functional Relations Derived From Geometrical Analysis and a Modified Birkhoff Theory for Linear Shaped Charge Optimization” International Test and Evaluation Association (ITEA) conference 2010, El Paso, TX.
15. **Lim, Seokbin**, “Deformation of An Explosively Driven Flat Metallic Flyer During Projection” Proceedings of the 36th Annual conference of ISEE, 2010. Orlando, FL.
16. Walsh, GA. Wilson, A.T. **Lim, Seokbin**, and Romero, V.D. “Design and Testing of an Underwater Passive Pressure Gauge” Proceedings of the 35th Annual conference of ISEE, 2009
17. Vogel, P., **Lim, Seokbin**. “Case Study of the Application of Gurney Equations to Simplified Shrapnel Lethality Estimation in Comprehensive Military Utility Analysis Models” 2008 Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), 2008
18. **Lim, Seokbin**, “A Preliminary Investigation of the Blade Formation Process of Linear Shaped Charges” CEMED (Center for Energetic Materials and Energetic Devices) Internal Conference, EMRTC, Socorro, NM, Feb 27th, 2007
19. **Lim, Seokbin**, Baird, J., Worsley, P.N., “Mechanics of the Run up on Linear Shaped Charges Cutting”, Proceedings of the 32nd Annual conference of ISEE, 2006
20. Lusk, B., **Lim, Seokbin**, Worsley, P.N., Frost, L., “Large Arena Test Simulator Using Small High Explosive Charges”, Proceedings of the 32nd Annual conference of ISEE, 2006
21. **Lim, Seokbin**, Lusk, B., Worsley, P.N., “Mechanisms of Linear Shaped Charge Cutting – A New Explanation”, Proceedings of the 31st Annual conference of ISEE, 2005
22. **Lim, Seokbin**, Worsley, P.N., “An Introduction to the Halo Effect”, Proceedings of the 31st Annual conference of ISEE, 2005
23. **Lim, Seokbin**, Lusk, B., Worsley, P.N., “An Investigation of The Blade Formation & Cutting Process of Linear Shaped Charges”, Proceedings of the Annual conference of Korea Institute of Military Science and Technology (KIMST), Aug 30, 2005
24. **Lim, Seokbin**, Lusk, B., Worsley, P.N., “The Characteristic of Blade Formation/Cutting Process of Linear Shaped Charges (LSCs)”, 76th Shock & Vibration Symposium, Oct 30, 2005
25. **Lim, Seokbin**, Worsley, P.N., “An Investigation of The Characteristics of Linear Shaped Charges Used in Demolition”, ISEE 29th Annual conference ISEE, 2003

OTHER PRESENTATIONS & INVITED SEMINARS

1. **Seokbin Lim**, “Acceleration Profile of An Explosively Driven Flat Metallic Flyer During Projection”, NMT & ADD Inter-Institutional Meeting, Socorro, NM. July 2013.
2. **Lim, Seokbin**, “Determination of the Velocity Profile of Shaped Charges Jet” Department of Petroleum Engineering at NMT, Projection consortium meeting, Invited Speaker, May 2012.
3. **Lim, Seokbin**, “Development of the Active Protection System (APS) Utilizing Linear Shaped Charges Against Incoming RPG”, Graduate Seminar, Department of Mechanical Engineering, NMT, Sep 2010. Socorro, NM.
4. **Lim, Seokbin**, “Emerging Technologies for National Security Applications and Energetic Systems Research Group at NMT” Agency for Defense Development (ADD), Invited Seminar. Taejon, South Korea, June 26th, 2008
5. **Lim, Seokbin**, “Initiation of Energetic Materials and Theoretical Characteristics” Korea Institute of Geology, Mining and Materials (KIGAM), Invited Seminar, Taejon, South Korea, June 24th, 2008
6. **Lim, Seokbin**, “Fundamental Characteristics and Applications of Energetic Materials”, Department of Mechanical Design Engineering, Chungnam National University, Guest Lecture, Taejon, South Korea, June 16th, 2008

7. **Lim, Seokbin**, “Characteristics of Explosives and IED Detection Technology” Karagozian & Case, Internal Quarterly Seminar, Invited Seminar, Burbank, CA 17th Jan, 2008
8. **Lim, Seokbin**, “Characteristics of linear shaped charge jet and its formation”, Society for Mining, Metallurgy, and Exploration (SME) chapter meeting, St. Louis, MO, Guest speaker, May 20th, 2004
9. **Lim, Seokbin**, “The Detailed Characteristics of Linear Shaped Charges Used in Demolition”, Korea Institute of Geoscience & Mineral Resources (KIGAM), Taejon, Korea, Quarterly Seminar, Guest speaker, June 18th, 2004

TECHNICAL REPORTS

1. **Lim, Seokbin**, “DHS Homeland Security STEM Career Development Grant: NMT Explosives Engineering HS-STEM Program”, Final Report, March 2013.
2. **Lim, Seokbin**, “Shaped Charges Driven Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase III, Final Report, Oct 2013.
3. Mike Smith, **Seokbin Lim**, “Optimization of the explosively driven pipe welding field operation”, Progress report I, Aimone-Martin Assoc. Funded project. Dec 2013.
4. **Lim, Seokbin**, “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Force – Phase III” Sandia National Lab funded project, AUTODYN Hydrocode simulation Report III, Sep 2012.
5. **Lim, Seokbin**, “Shaped Charges Driven Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase III, Monthly Project Communications 1 ~ 7, June ~ Dec 2012.
6. **Lim, Seokbin**, “DHS Homeland Security STEM Career Development Grant: NMT Explosives Engineering HS-STEM Program”, 2011 Annual Report, April 2012.
7. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase II, Quarterly Report IV, April 2012.
8. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase II, Quarterly Report III, Jan 2012.
9. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase II, Quarterly Report II, August 2011.
10. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase II, Quarterly Report I, May 2011.
11. **Lim, Seokbin**, Johnston, M., “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Force – Phase III” Sandia National Lab funded project, Interim report III, Oct 2011.
12. Hockensmith, C. and **Lim, Seokbin**, “Course Curriculum and Laboratory Improvement (CCLI): Explosives Engineering Lab for Undergraduates (EELU)”, NSF funded project, Final Report, Aug 2011.
13. **Lim, Seokbin**, “DHS Homeland Security STEM Career Development Grant: NMT Explosives Engineering HS-STEM Program”, 2010 Annual Report, Mar 2011.
14. Hockensmith, C. and **Lim, Seokbin**, “Course Curriculum and Laboratory Improvement (CCLI): Explosives Engineering Lab for Undergraduates (EELU)”, NSF funded project, 2009 Annual Report, Aug 2010.
15. **Lim, Seokbin**, “DHS Homeland Security STEM Career Development Grant: NMT Explosives Engineering HS-STEM Program”, 2009 Annual Report, Mar 2010.
16. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase I, Quarterly Report IV, Dec, 2010.
17. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase I, Quarterly Report III, Aug, 2010.
18. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase I, Quarterly Report II, May, 2010.
19. **Lim, Seokbin**, Johnston, M., “Numerical Approaches for the Rapid Creation of Expedient Tactical Entry Holes in Typical Urban Wall Systems”, ONR funded project – Phase I, Quarterly Report I, Mar. 2010.
20. **Lim, Seokbin**, “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Force – Phase II” Sandia National Lab funded project, AUTODYN® Hydrocode Simulation Report II (brief), Dec 2010.
21. **Lim, Seokbin**, “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Force – Phase II” Sandia National Lab funded project, AUTODYN® Hydrocode Simulation Report I (brief), Oct 2010.
22. **Lim, Seokbin**, Findlay, C. R., and Thompson, A., “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Forces – Phase II, Interim Project Report II” Aug 2010.
23. **Lim, Seokbin**, Findlay, C. R., and Bakhtiyarov, A., “An Engineering Design of Linear Shaped Charges Driven by Electromagnetic Forces – Phase I, Interim Project Report I” Aug 2009.
24. **Lim, Seokbin**, and Helgeson, W. “Exothermic Amplification for Pulsed Electrical Rock Drilling (EAPERD) – Phase I, Interim Progress Report 2”, Apr 30th, 2008.

25. **Lim, Seokbin**, and Helgeson, W. “Exothermic Amplification for Pulsed Electrical Rock Drilling (EAPERD) – Phase I, Interim Progress Report 1”, Jan 24th, 2008.

Arash Kheyraadini Mousavi

New Mexico Tech

801 Leroy Place, Brown Hall, Room 2C

Socorro, NM, 87801-4796

Phone: (575)-835-5003 • E-Mail: mousavi@nmt.edu

AREAS OF EXPERTISE AND INTEREST

Nanotechnology, MicroElectroMechanical Systems (MEMS), Fabrication, Cleanroom, Lithography and Silicon Processing, Advanced Programming, Simulation, Artificial Neural Networks, Genetic Algorithms, Molecular Dynamics (MD), Finite Element Methods (FEM), Fracture Mechanics, Carbon Nano Fibers, Digital Image Processing, Optics, Lasers, Composite Materials, Cellular Biology, Cancer, Biomimicry

EDUCATION

Ph.D., Mechanical Engineering

The University of New Mexico, Albuquerque, NM

Expected in December, 2014

- *Dissertation Title: Critical Strain Energy Release Rate Measurement And Modeling For poly-Si And Nondestructive Repair Of Stiction Failed MEMS*
- *Adviser: Professor Zayd C. Leseman*
- *Area of Study: MEMS*

M.S., Mechanical Engineering

Amirkabir University of Technology, Tehran, Iran

March 2008

- *Thesis Title: Dynamics And Stability Analysis Of A 4-Link Biped Robot*
- *Adviser: Dr. Farshad Barazandeh*
- *Area of Study: Dynamics and Robotics*

B.S., Mechanical Engineering

University of Tabriz, Tabriz, Iran

September 2005

- *Thesis Topic: Vibrational Analysis Of Power Lines Equipped With Stock-Bridge-Dampers, For Location Optimization By Amplitude Minimization In Frequency Domain*
- *Adviser: Professor Morteza H. Sadeghi*
- *Area of Study: Vibrations and Optimization*

QUALIFICATIONS

Fabrication

- *Lithography* (1 year of experience)
- *Working in cleanroom environment* (1 year of experience)
- *Si processing* (1 year of experience)
- *Sandia MEMS Design Tool Suite* (3 years of experience)
- *Wire bonding* (3 months of experience)

Programming

- *Advanced Object Oriented Programming with MATLAB* (10 years of experience)
- *LabVIEW* (3 years of experience)

Characterization and Testing

- *Probe Stage Microscope* (4 years of experience)



- Optical Microscopy (5 years of experience)
- Interferometry (5 years of experience)
- Digital Image Analysis (4 years of experience)
- Scanning Electron Microscopy (SEM) (2 months of experience)
- Focused Ion Beam (FIB) (2 months of experience)
- Sensor based methods (strain gage, thermocouple, laser Doppler vibrometer)
- Instron (2 year of experience)
- Rheometry (4 months of experience)
- Differential Scanning Calorimetry (DSC) (6 months of experience)

Engineering Simulations

- Finite Element Analysis (8 years of experience)
- Molecular Dynamics (3 months of experience)

Optics and Microscopy

- Interferometry, Optics, Microscopy (5 years of experience)

Composite Materials:

- Working with Prepregs, Differential Scanning Calorimetry, Rheometry (1 year of experience)

RESEARCH EXPERIENCE

New Mexico Tech, Socorro, NM

January 2015 to present

Assistant Professor

- Micro-Electro-Mechanical Systems

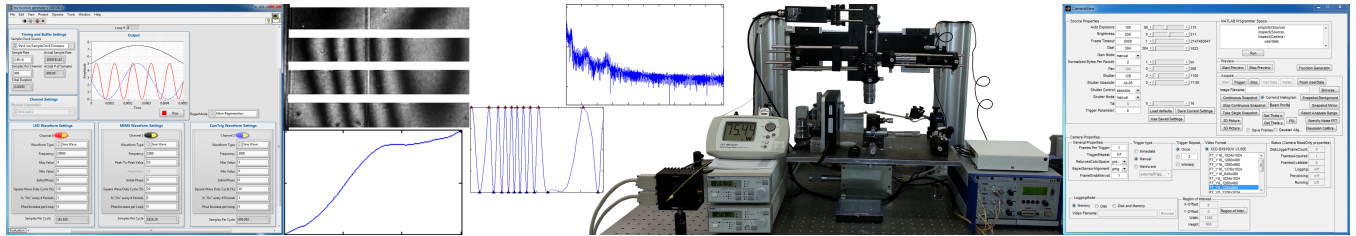
The University of New Mexico, Albuquerque, NM

May 2009 to December 2014

Research Assistant, PhD Student

Supervisor: Professor Zayd C. Leseman

- Experimental and theoretical study of surface adhesion energy and its effects in stiction failure of MEMS
- Designing and erecting a laser based Michelson interferometer for 3D imaging of MEMS devices with sub-angstrom out of plane accuracy while eliminating the need for mechanical motion of the reference mirror
- Developing the image acquisition and image processing software to run the interferometer
- Determine out of plane deformations of the stiction failed MEMS devices, vibrational modes of Phononic crystals
- Reverse dynamical analysis of micro and nano-devices for forces calculations
- Developing a LabVIEW program for synchronized actuation of multiple MEMS devices as well as controlling laser source used for interferometry.
- Developing spectroscopy module to study real time crack propagation in stiction failed MEMS
- Studying different modes of stiction failure in MEMS and application of fracture mechanics methods to predict crack propagation initiation
- Non-woven Carbon nano-foams and characterization of their mechanical properties



Wichita State University, Wichita, KS
Research Assistant

Supervisor: Professor Hamid M. Lankarani

- Working in collaboration with Boeing, Cessna and Hawker Beechcraft to study the mechanical properties of resin based carbon fiber composite samples made using prepregs, and develop TTT charts for different fiber reinforced resin composites
- Differential Scanning Calorimetry
- Rheometry

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran
Research Assistant

- Supervisor: Professor Farshad Barazandeh
- Dynamic analysis, gait generation and control of feet-less biped robots
- Human locomotion
- Artificial Neural Network
- Nonlinear Control

TEACHING EXPERIENCE

New Mexico Tech, Socorro, NM
Assistant Professor

January 2015 to present

- Mechatronics, MENG 483
- Mechatronics Lab, MENG 483L
- Graduate-Faculty Seminar, MENG 585
- Dynamic Systems and Controls, MENG 405
- Dynamic Systems and Controls Lab, MENG 405L
- Micro/Nano-ElectroMechanical Systems, MENG 586-2
- Micro/Nano-ElectroMechanical Systems Lab, MENG 586-2L

The University of New Mexico, Albuquerque, NM

Spring Semester 2014

Teacher Assistant

Spring Semester 2014

- Course: Theory, Fabrication, and Characterization of Nano and Microelectromechanical Systems (ME-519)
- Supervisor: Dr. Zayd C. Leseman
- Graduate students learn how work in MTC's cleanroom and fabricate their own comb drive MEMS actuators and test them.

Teacher Assistant

Spring Semester 2013

- Course: Micro-Electronic Processing (ECE-574)
- Supervisor: Dr. Ashwani K. Sharma



- Graduate students learn how work in MTTTC's cleanroom and fabricate their own N-type enhancement mode MOSFET transistor and test it.

Teacher Assistant

Spring Semester 2013

- Course: Mechanical Engineering Design III (ME-360)
- Supervisor: Professor Juan Heinrich
- Finite elements analysis of solid parts, shells, contacting elements
- Students learned how to design and perform FEM analysis using Creo (Pro-Engineer).

Instructor

Spring & Fall Semester 2012

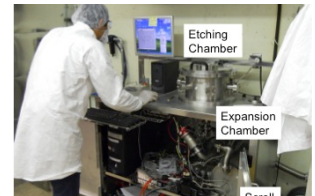
- Instructor for ME-314: Undergraduate Machine Design
- Students learned graphical and analytical techniques used in kinematic and kinetic analysis of common engineering mechanisms, such as n-bar mechanisms, gear trains, cams as well as balancing of 2D and 3D rotary systems.

LANGUAGE SKILLS

- English (Fluent)
- Persian (Native)
- Azeri (Native)
- Turkish (Intermediate)

PATENTS

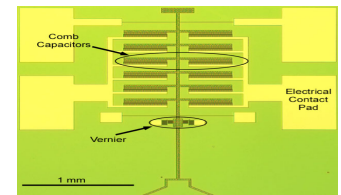
[1] "Process for the Determination of Volumes of Vacuum Chambers and Equilibrium Times for a Vacuum System", Zayd Leseman, Khawar Abbas, Mirza Elahi, **Arash K. Mousavi**, Edison Lima, and Stephen Moya, WIPO Patent Application #: WO 2015/054044 A2



[2] "Real-time Interferometry Systems", **Arash K. Mousavi** and Zayd Leseman. (submitted).

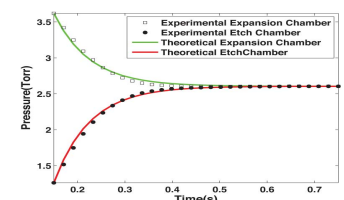
BOOK CHAPTER PUBLICATIONS

[3] **Arash K. Mousavi** and Zayd C. Leseman, Chapter: Basic MEMS Actuators. Bharat Bhushan, "Encyclopedia of Nanotechnology", Springer. 2012, Pages 173-185, ISBN 978-90-481-9750-7, DOI: 10.1007/978-90-481-9751-4



REFEREED JOURNAL PUBLICATIONS

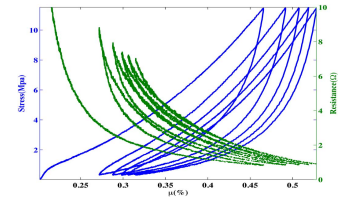
[4] **Arash K. Mousavi**, Khawar Abbas, Mirza Mohammad Mahbube Elahi, Edison Lima, Stephen Moya, Joseph Daniel Butner, Denise Pinon, Adeeko Benga, Behnam K. Mousavi, Zayd C. Leseman. "Pulsed Vacuum and Etching Systems: Theoretical Design Considerations for a Pulsed Vacuum System and its Application to XeF2 Etching of Si", Vacuum 109 (2014), pp. 216-222. DOI: 10.1016/j.vacuum.2014.07.028,



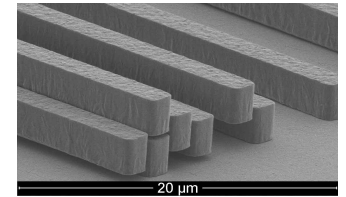


Impact Factor: 1.249

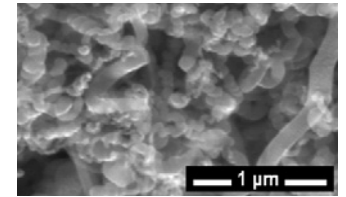
[5] **Arash K. Mousavi**, Mark A. Atwater, Behnam K. Mousavi, Mohammad Jalalpour, Mahmoud Reda Taha and Zayd C. Leseman. "Mechanical and Electrical Characterization of Entangled Networks of Carbon NanoFibers", *Materials* 2014, 7(6), 4845-4853; DOI:10.3390/ma7064845, Impact Factor: 1.879



[6] **Arash K. Mousavi**, Maheshwar R. Kashamolla and Zayd C. Leseman. "Improved Model for the Adhesion of μ cantilevers: Theory and Experiments". *Journal of Micromechanics and Microengineering*, Volume 23, Issue 11, November 2013. DOI: 10.1088/0960-1317/23/11/115011. Impact Factor: 1.790



[7] Mark A. Atwater, **Arash K. Mousavi**, Zayd C. Leseman and Jonathan Phillips. "Synthesis and Characterization of Fibrous Carbon Foam". *Carbon*. June 2013, Volume 57, Pages 363 - 370. DOI: 10.1016/j.carbon.2013.01.084. Impact Factor: 6.350



REFEREED CONFERENCE PUBLICATIONS

- [8] Maheshwar Kashamolla, Drew Goettler, **Arash K. Mousavi** and Zayd C. Leseman. "Mode II Measurements for Stiction Failed MEMS Devices". In: Proceedings of ASME 2010 International Mechanical Engineering Congress and Exposition, (IMECE2010-39013), Volume 10: Micro and Nano Systems, Pages 63-69. Vancouver, British Columbia, Canada, November 12-18, 2010. DOI:10.1115/IMECE2010-39013
- [9] **Arash K. Mousavi**, Seyedhamidreza Alaie, Maheshwar R. Kashamolla and Zayd Chad Leseman. "Nonlinear Approach for Strain Energy Release Rate in Micro Cantilevers". In: Proceedings of ASME 2010 International Mechanical Engineering Congress and Exposition, (IMECE2010-38905), Volume 10: Micro and Nano Systems, Pages 51-56. Vancouver, British Columbia, Canada, November 12-18, 2010. DOI:10.1115/IMECE2010-38905
- [10] Seyedhamidreza Alaie, **Arash K. Mousavi**, Mehmet Su, and Zayd C. Leseman, "Finite Element Modeling of a Phononic Crystal Operating at Gigahertz Frequencies". In: Proceedings of the ASME International Mechanical Engineering Congress and Exposition, (IMECE2010-39005), Volume 13: Sound, Vibration and Design, Pages 389-394. Vancouver, British Columbia, Canada, November 12-18, 2010.
- [11] Maheshwar R. Kashamolla, **Arash K. Mousavi** and Zayd C. Leseman. "Mode I and Mixed Mode I and II Measurements for Stiction Failed MEMS Devices". In: Proceedings of ASME 2009 International Mechanical Engineering Congress and Exposition, (IMECE2009-11531), Volume 12: Micro and Nano Systems, Parts A and B, Pages 25-31. Lake Buena Vista, Florida, November 13-19, 2009. DOI:10.1115/IMECE2009-11531



- [12] S. Alavi-Soltani, S. Sabzevari, **Arash K Mousavi**, B. Minaie. "Modeling of Gelation and Vitrification Points for Polymer Composites Using Shear Rheometry", In: Proceedings of International SAMPE Symposium And Exhibition, SAMPE 54th Symposium. Baltimore, Maryland, May, 2009. ISBN: 1934551058, Available on CD-ROM. ISBN: 978-1-934551-05-9, Society for the Advancement of Material and Process Engineering,
- [13] S. Alavi-Soltani, **Arash K Mousavi**, S. Sabzevari, B. Minaie. "Material State Modeling During Combined Ramp and Isothermal Cure Cycles for Polymer Composites Using Shear Rheometry and Thermal Analysis". In: Proceedings of International SAMPE Symposium And Exhibition, SAMPE 54th Symposium. Baltimore, Maryland, May, 2009. ISBN: 1934551058, Available on CD-ROM. ISBN: 978-1-934551-05-9, Society for the Advancement of Material and Process Engineering

CONFERENCE TALKS

- [1] **Arash K. Mousavi** and Zayd C Leseman, "Effects of Residual Stresses and Loading on the Critical Strain Energy Release Rate of Peel Tested micro-cantilevers". In: ASME 2011 International Mechanical Engineering, Congress & Exposition, Denver, Colorado, November 11–17, 2011.
- [2] **Arash K. Mousavi** and Zayd C Leseman, "Mixed Mode I and II Strain Energy Release Rate For Large Deflections on Poly Silicon Micro Cantilevers". In: SEM 2011 Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, Connecticut, June 13-16, 2011.
- [3] **Arash K. Mousavi** and Zayd C Leseman, "Strain Energy Release Rate and Stress Intensity Factors For Mode II Crack Development of Poly-Silicon micro Cantilevers". In: SEM 2011 Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, Connecticut, June 13-16, 2011.
- [4] **Arash K. Mousavi** and Zayd C Leseman, "Strain Energy Release Rate and Stress Intensity Factor Correlation for poly silicon Micro Cantilever", In: SEM 2011 Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, Connecticut, June 13-16, 2011.
- [5] **Arash K. Mousavi** and Zayd C Leseman, "Nondestructive repeatable stiction repair for polysilicon micro-cantilevers", In: SEM 2011 Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, Connecticut, June 13-16, 2011.
- [6] **Arash K. Mousavi** and Zayd C Leseman, "Transient Vibrations of Stiction Failed Micro Cantilever and Dynamic Crack Propagation", In: SEM 2011 Annual Conference & Exposition on Experimental and Applied Mechanics, Uncasville, Connecticut, June 13-16, 2011.
- [7] **Arash K. Mousavi** and Zayd C Leseman, "Nonlinear Fracture Mechanics Model for Mode I & Mode II Stiction Failure", In: AVS 57th International Symposium & Exhibition, Albuquerque, New Mexico, October 17-22, 2010.
- [8] **Arash K Mousavi**, Farshad Barazandeh and Mohammad Hassan Ghaffari Saadat. "Synthesis of a Complete Sagittal Gait for a Four-Link Biped", In: 4th International Conference on Advances in Mechanical Engineering and Mechanics (ICAMEM 2008), Sousse, Tunisia, December 16-18, 2008.
- [9] **Arash K Mousavi** and Farshad Barazandeh, "Complete Sagittal Gait Synthesis of a Biped Vehicle With a Passenger Cabin", In: Canadian Society for Mechanical Engineering Forum 2008 (CSME/SCGM), Ottawa, Canada. June 5-7, 2008.

CONFERENCE POSTERS

- [10] **Arash K. Mousavi**, Zayd C. Leseman, "Stiction failure of Micro-Electro-Mechanical-Devices", In: ASME 2011 International Mechanical Engineering, Congress & Exposition, Denver, Colorado, November 11–17, 2011. Poster abstract.



HONORS AND AWARDS

- [1] Miller Metal Company Endowed Fellowship, Spring 2011
- [2] Outstanding Graduate Award, Department of Mechanical Engineering, School of Engineering, University of New Mexico, 2011
- [3] The Center of Multi-Scale Mechanics and Material Science Award, Mechanical Engineering Department, University of New Mexico, 2011

BIGGER COMMUNITY SERVICES

- [1] Voting member of the Search Committee For The Next Vice President of Research and Economic Development (VPRED) for University of New Mexico, Fall 2012-Spring 2013
- [2] Member of Research Policy Committee of The University of New Mexico, 2011- 2013
- [3] President of Mechanical Engineering Graduate Students Association (MEGA), University of New Mexico, Sept 2011-December 2012
- [4] Council Representative of Mechanical Engineering in Graduate and Professional Student Association, (GPSA), University of New Mexico, 2011-2012

OTHER HARDWARE AND SOFTWARE SKILLS

Finite Element and CAD Packages:

- ANSYS, *(including Macro programing)*
- COMSOL
- PTC Creo *(Pro/ENGINEER)*
- Autodesk AutoCAD
- Dassault Systèmes CATIA
- Working model

Programing Languages & Numerical Analysis

- MATLAB and SIMULINK *(Object Oriented Programing)*
- LabVIEW
- Fortran
- Assembler
- C++
- Mathematica

Instrumentation, Control, Data Acquisition, Test, and Measurement:

- LabVIEW
- SIMULINK
- Agilent bench-top equipment

Molecular Dynamics Packages

- TINKER Molecular Modeling

Desktop Editing and Productivity Software:

- TEX (LATEX, BIBTEX)
- Microsoft Office
- Adobe Photoshop



Operating Systems:

- *Microsoft Windows family, Apple OS X, Linux*

STUDENT MENTORING

Benga Adeeko

Undergraduate student in Mechanical Engineering, University of Texas - San Antonio, Learning about high vacuum technology and building a cylindrical vacuum chamber with two viewports for experiments with MEMS devices, Summer 2009

Vincent Watkins, Willy Stephens and Micah John

Undergraduate students in Southwestern Indian Polytechnic Institute, Getting introduced to MEMS, learning how to use Sandia Advanced MEMS Design Tools and getting help to compete in the Annual Sandia MEMS University Alliance Design Competition, Fall 2011 and Spring 2012 semesters

PROFESSIONAL MEMBERSHIPS

American Society of Mechanical Engineering (ASME), Member, 2011–present

APPLICATION AREAS

Nanotechnology, Programing, Fabrication, MEMS, NEMS, Bio-MEMS, Optics, Control Systems, Simulation, Manufacturing, General Engineering

REFERENCES

Available upon request. otherwise, please feel free to contact:

Dr. Zayd C. Leseman

Associate Professor
Mechanical Engineering Department
University of New Mexico
E-mail: zleseman@unm.edu
Tel: (505)-277-4940

Prof. Yu-lin Shen

Professor
Mechanical Engineering Department
University of New Mexico
E-mail: shenyl@unm.edu
Tel: (505)-277-6286

Prof. Johann van Reenen

Professor and Associate Vice President
Office of the Vice President for Research
University of New Mexico
327 Scholes Hall, MSC 05 3480 Albuquerque, NM 87131
E-mail: jreenen@unm.edu

Dr. Sayavur I. Bakhtiyarov



Associate Professor
Mechanical Engineering Department
New Mexico Institute of Mining and Technology
E-mail: sayavur@nmt.edu

Warren J. Ostergren

Vice President, Academic Affairs
New Mexico Tech
801 Leroy Place, Socorro, NM, 87801

Office: Brown 201A
Phone: (575) 835-5363
E-mail:warreno@nmt.edu

EDUCATION

PhD – Mechanics - Rensselaer Polytechnic Institute, Troy, NY, 1976
MS – Engineering - Brown University, Providence, RI, 1969
BS – Mechanical Engineering - University of Rochester, Rochester, NY, 1967

EMPLOYMENT HISTORY

Vice President, Academic Affairs, New Mexico Tech, 2014-present
Chair, Mechanical Engineering Department, New Mexico Tech, 2009-2014
Associate Professor, Mechanical Engineering Department, New Mexico Tech, 2004-2009
Adjunct Professor, Management Department, New Mexico Tech, 2003-2004
Adjunct Professor, York County Technical College, Wells, ME, 2001-2002
Vice President of Engineering, WASTECH Inc., Portsmouth, NH, 2001-2002
F414 Engine Program Manager, GE Aircraft Engines, Lynn, MA, 1999-2001
F404 Engine Program Manager, GE Aircraft Engines, Lynn, MA, 1995-1998
Manager JTAGG Engineering, GE Aircraft Engines, Lynn, MA, 1993-1994
Manager Component Technology Programs, GE Aircraft Engines, Lynn, MA, 1991-1992
Manager Structures, Stress and Vibration, GE Aircraft Engines, Lynn, MA, 1985-1990
Manager Mechanical Development, GE Medium Steam Turbines, Lynn, MA, 1982-1984
Manager Mechanics of Materials, GE Gas Turbines, Schenectady, NY, 1974-1982
Engineer Mechanics of Materials, GE Gas Turbines, Schenectady NY, 1972-1974
Engineer Generator Design, GE Generator Department, Schenectady NY, 1968-1972

ACADEMIC EXPERIENCE

New Mexico Tech - Socorro, NM

Vice President – Academic Affairs (2014-present) – Responsible for the academic curriculum of the institution. Oversees faculty and academic staff recruitment and development activities. Provides advisory recommendations to the president on academic appointments, tenure and promotion matters. Oversees curriculum and periodic program reviews and works with department chairs in the development of curriculum and in the improvement of instruction. Prepares and updates accreditation reports and oversees accreditation visits. Coordinates faculty tenure and merit reviews. Manages the budget for the academic division. Chairs Council of Chairs. Reviews student appeals of curricular and classroom matters. Provides link to the Faculty Senate and conveys Senate's recommendations to the President. Develops partnerships with industry and secondary institutions. Writes grants to procure external funding and supervises grant-funded projects. Represents the institute at local, state, regional meetings.

Chair – Mechanical Engineering (2009-2014) – Responsible for leading the department in supporting the institute and department missions, facilitating department decisions and managing department resources.

Key accomplishments of the team include:

- Successfully led rapid growth of undergraduate and graduate enrollment during a period of severe financial constraint within the state funded system.
- Completed successful ABET accreditation.
- Selected for FAA Center of Excellence for Commercial Space Transportation.
- Secured research grants from a variety of organizations; including, Sandia National Labs, Department of Homeland Security, NASA, ONR, DOE and Air Force Research Labs.
- Recruited new outstanding tenure track faculty members.
- Developed a robust program of graduate courses offered live on campus and via distance education.
- Participated in delegation to Yangtze University in China, which successfully created joint educational program.
- Continued development of minor programs in aerospace, explosives and biomedical engineering.
- Created five new research laboratories for the department in robotics and haptics, particle image velocimetry (PIV), gas dynamics and shock measurement, shock physics and hypervelocity material effects.
- Enhanced existing lab space to support aerospace related design clinic projects such as model airplane and experimental sounding rocket teams.
- Initiated undergraduate and graduate student representative positions to foster good communication and to act as ombudspersons for any student issues within the department.
- Created unique technical writing and graduate communication courses for the department which are integrated into other mechanical engineering courses.

Associate Professor (2004-2009) – Responsible for teaching undergraduate and graduate mechanical engineering courses, developing research programs, advising students and participating in service activities in the profession and for the university.

Key accomplishments include:

- Established a unique junior/senior design clinic program in which students perform design work on actual industrial/research projects that span multiple years, depending on complexity.
- Initiated design conferences, where student teams have the opportunity to present their design and research activity to external sponsors and the NMT community. Students provide presentations and posters on their projects to the broad technical community.
- Member of patent team for “Heliostat with Actively Controlled Liquid Ballast System” - US 8,231,222 B2, based on undergraduate and graduate research supported by the EPA and Sandia National Labs.
- Taught highly rated courses in advanced strength of materials, advanced mechanics of materials, design clinics, managing technology and engineering statistics.

- Launched successful continuous improvement program as department's ABET representative to achieve accreditation and improve department.

INDUSTRIAL EXPERIENCE

GE Aircraft Engines – Lynn, MA

F414 Program Manager (1999-2001) - Responsible for engineering management of F414 engines on F/A-18 Navy Super Hornet Aircraft. Responsibilities include technical management and customer interface with \$40M annual budget for new component developments, production and field problems.

Key accomplishments include:

- Successfully led teams to solve unique design problems on F414 engine program, including afterburner cracking, combustor flameout and engine performance.

F404 Program Manager (1995-1998) – Responsible for engineering management of F404 engines on F/A-18 Navy Hornet Aircraft. Responsibilities include technical management and customer interface.

Key accomplishments include:

- Developed new process for component design and integration using Integrated Project Teams.
- Provided outstanding technical integration with US Navy, achieving unprecedented engine availability.

Manager JTAGG Engineering (1993-1994) – Responsible for engineering leadership of advanced turboshaft engine program supported by Army, Navy and Air Force with objective of doubling turbine engine performance.

Specific accomplishments include:

- Led team that exceeded performance goals on advanced turboshaft engine program, demonstrating 20% reduction in fuel consumption and 40% improvement in power to weight.

Manager Component Technology Programs (1991-1992) – Responsible for engineering technical management of programs funded by US Government to develop critical technology needs for advanced aircraft engine components, including blade film cooling, combustors, seals, turbines and metal matrix composites.

- Achieved technical objectives on advanced technology projects and achieved unprecedented customer satisfaction.

Manager Structures, Stress and Vibration (1985-1990) – Responsible for managing technical work of 30 engineers conducting dynamic analysis of aircraft engine systems and structures.

Specific accomplishments include:

- Introduced new structural buckling methodology for aircraft engine hot section components and 3D dynamics analysis for aircraft engine rotor systems, including non-linear blade loss events, successfully predicting field experience.

GE Medium Steam Turbine, Lynn, MA

Manager Mechanical Development (1982-1984) – Responsible for design and development of static components applied in utility, industrial and ship propulsion turbines.

Specific accomplishments include:

- Provided design and analysis of mounting systems to minimize structureborne vibration from new propulsion components in submarines and destroyers.

GE Gas Turbines, Schenectady, NY

Manager Mechanics of Materials (1974-1982) – Responsible for developing gas turbine materials behavior predictive methods in creep, fatigue and fracture; directing laboratory test programs and providing materials design criteria.

Specific accomplishments include:

- Identified the impact of manufacturing and material processes on the mechanical behavior of gas turbine materials and secured external agency funding for mechanics of materials programs in thermal fatigue and turbine cooling technology.
- Developed design methods for predicting the low cycle fatigue, thermal fatigue and creep life capability of gas turbine engines. Published numerous technical articles on low cycle fatigue and creep damage accumulation at elevated temperatures, including ASME special publications.

Engineer Mechanics of Materials (1972-1974) - Responsible for developing gas turbine materials behavior predictive methods in creep, fatigue and fracture; directing laboratory test programs and providing materials design criteria.

Specific accomplishments include:

- Developed a damage function low cycle fatigue methodology which was widely cited for explaining the unique hold time behavior of high temperature superalloy materials.

GE Generator Department, Schenectady, NY

Engineer, Generator Design (1968-1972) - Responsible for design of large rotating generator equipment, analysis of rotating parts and development of analysis techniques.

Specific accomplishments include:

- Established use of fracture mechanics for determining acceptability of large rotating components in power generation equipment.

EXTERNAL GRANTS

- PI on Jacobs Engineering project, “Jacobs Paid Internship Program” funded for \$250K.
- PI on VentureWell sponsored project, “Reduced Cost Heliostat” funded for \$5K.

- PI on New Mexico Space Grant Consortium sponsored project, “Enhancing the Living Learning Community” funded for \$36K.
- PI on FAA sponsored project, “Nitrous Oxide Composite Case Testing and Analysis” funded for \$120K.
- Co-PI on FAA sponsored project, “Magneto-Elastic Sensing for Structural Health Monitoring” funded for \$150K.
- Co-PI on FAA sponsored project, “Reduced-Order Non-Linear Dynamic System Models ” funded for \$150K.
- PI on Sandia National Labs contract for “Improved Heliostat Focusing and Canting” funded for \$90K.

GRADUATE STUDENT PROJECTS AND THESES ADVISED OR COMMITTEE MEMBER

- Kyle Feliciano Chavez – “Development and Application of an Optical Method for Efficiently Canting In-Field Heliostat Mirror Facets” – MS in Mechanical
- Evan G. Sproul – “An Optical Method for Focusing and Characterizing Heliostat Mirror Facets” – MS in Mechanical
- Jake Scarbrough - Evaluation of the Current Product Development Process and Project Management Methods Used by the LANL Weapons Division – MEM
- Stephenie Ann Sterbling Drauschak - “ A Review of the Development of Select Furazan-Based Molecules” MS in Mechanical
- Susan R. Murphy - "A Blueprint for Manufacturing Process Transfers in Industrial Corporations" – MEM
- Tony Gardner - "Best Practices for Implementing the Lean Manufacturing Approach to Maintenance at Intel” – MEM
- Matthew J. Majors – “Statistical Distribution and Simulation used in Conjunction with “Aladon – RCM2 Decision Diagram” to Select Maintenance Tasks-MEM Associated with Equipment Failure Modes at Barrick Cortez JV
- Michael Lucero – “Improved Management Practices for the COPY EXACTLY! Manufacturing Process” - MEM
- Benjamin Nicholas Davis – “Detonation Performance of the Insensitive High Explosive 1,3,5- Triamino-2,4,6-trinitrobenzene (TATB) – MS in Mechanical
- Rodrigo Azevedo Lopes – “Simulating High Frequency Trading During Normal and Abnormal Days” - MEM
- Tyson Gobble – “Development of an Improved Program Management Process for Department of Energy (DOE) Projects” – MEM
- Emre Yetistirici – “Cost Optimization for EVLA Antennas Cryogenic Cooling Systems” - MEM
- Brett Allen Carey - “An Investigation of Geometric Explosive Charge Effects in an Urban Environment for C4 and ANFO” – MS in Mechanical.
- Arthur H Weber – “A Review of Satellite Attitude Determination Without Gyroscope” – MS in Mechanical.
- Marcus Alexander Chávez – “Implications of Explosively Accelerating Thin Flyer Plates in the Transient Regimes of Explosive Systems” - MS in Mechanical.
- Mahsa Karamy – “Improved Practices for Increasing Productivity and Customer (External & Internal) Satisfaction in a Service Organization” – MEM.

- David Josiah Vaughn – “Alternative Methods for Economic Analysis in Potash” – MEM.
- John Samuel Thurman – “Application of Analytic Hierarchy Process to Air Force Research Lab Source Selection” – MEM.
- Donald Fresquez - Reduced Intel Opportunity Cost Through Increased Technical Knowledge of Internal Fab 11X Lithography Resources – MEM
- Jason Rogers – “DDT Testing of Granular Double-Base Small Arms Propellant” - MS in Mechanical.
- Joseph Trujillo – “Comparative Analysis of Explosive Qualification Driver and Generator Driver Design and Performance” - MS in Mechanical.
- Winston Wilches - Evaluation of Plastic Microspheres as Sensitizers for Emulsion Explosives in Colombia – MS in Mechanical
- Matthew Johnston – “An Analytical Approximation of the Critical Jet or No Jet Angle of a Shaped Charge Liner.” – MS in Mechanical.
- Steven Padilla – “The Commercial Development of an Engineering Services Firm’s Custom Software Product, Practical Considerations, Decision Analysis and Application” – MEM.
- Victor Apodaca – “Decision Cost Model for Contractor Selection” – MEM.
- Ephraim Ford – “Best Practices for Resourcing and Planning a High Technology Production Program” – MEM
- Salah Habachi – “Methods Used to Estimate Formation Pore Pressure” - MS
- Yi Svec – “Decision on Implementation of New Technology in a Mature Oil Field” – MEM
- Delilah Walsh – “Socorro County Technology Asset Management Plan” – MEM
- Doug Jones - Revenue Modeling of Remote Monitoring Equipment on Gas Wells for Product Pricing and Feasibility – MEM
- Michael Lucero - Improved Management Practices for the COPY EXACTLY! Manufacturing Process – MEM
- Nathan Rimkus - Development of Motivational Practices and Guidelines for Industrial Corporations and Research Centers
- Elmira Israilova – “Best Practices for the Rate Calculation Method of Rental Fleets at U.S. Universities” - MEM
- Jose Ramirez – “Improved Risk Management Process for Department of Defense Projects” - MEM
- Luis Mendoza – “Production Process for Advanced Space Satellite System Cables/Interconnects at Sandia National Laboratories” – MEM
- Darrell Eidson – “Project Scoping and Cost Estimating: Opportunities for Improvement” -MEM
- Gokcen Aykac – “A Total Quality Management Blueprint For Small Technology Companies” - MEM
- Joyce Utoh – “Small Chain Stores in the Wal-Mart World - Can They Survive?” - MEM
- Dan Kostelnick - "The Perfect Tool Install Design For Intel in Rio Rancho, N.M." – MEM
- Myles Fitzgerald - "Weingarten Realty Investors - A Capital Projects Study" - MEM

- Jason Mathews – “Shock and Vibration Characteristics of a Bio-Inspired Structure Under Blast Loading” – ME
- Camden Mullen – “Model and Simulation of Path-Goal Leadership Theory” – MEM
- Matthew Risenmay – “Requirements Driven Shaped Charge Design for Large Diameter Penetrations into Geologic Materials” - ME
- Kimberly Coleman – “Modeling Bridge Maintenance Decisions” - MEM
- Raghava Vudata – “Risk Analysis and Task Assignments of Self Organizing Networks” - MEM
- Chad Monthan – “Compressing the Cycle of Success Through Proper Planning Resource Management” - MEM
- Robert Smetana – “Contract Design For Sub-Tier Agents in Specialized Industries: Avoiding the Hold-Up Problem” - MEM
- Theresa Montoya – “Direct Metal Oxidation Furnace: A Thermal and Structural Analysis” - ME

AWARDS

- 2012 New Mexico Tech Distinguished Faculty Award
- 2007 New Mexico Tech Distinguished Teaching Award
- 2001 GE Aircraft Engine Engineering Department Award
- 1999 Collier Award (as a team) for F414 Development
- 1996 GE Aircraft Engine Achievement Award

PROFESSIONAL PUBLICATIONS

- Zagrai, A, Ostergren, WJ, Borden, LT, Zeman, S, “Focused Learning Strategy and Advanced Technologies Facilitating Competitiveness of Science, Technology and Engineering Professionals with Disabilities” Presentation at breakout session of 2010 Southwest Conference on Disability, 6-8 October 2010, Albuquerque Convention Center, Albuquerque, New Mexico.
- Jarvis, MS, Ostergren, WJ, and Smith, B., "The Applicability of Electrically Driven Accessories for Turboshaft Engines", ASME Journal of Engineering for Gas Turbines and Power, April 1995, p. 221.
- Peterson, LG; Hrencecin, DE; Schilling, WF and Ostergren, WJ, “Development of Hybrid Gas Turbine Technology”, Gas Turbine Division ASME, 1982.
- Wood, JH; Farrell, TR; Beltran, AM; Schilling, WF and Ostergren, WJ, “Development of Diffusion Bonded Claddings for Large Gas Turbine Applications”, EPRI Conference, 1981.
- Ostergren, WJ and Embley, GT, “Mechanical Property Requirements for Hot Section Components in Gas Turbines”, EPRI Conference, 1981.
- Chambers, WL; Ostergren, WJ and Wood, JH, “Creep Failure Criteria for High Temperature Alloys”, Journal of Engineering Materials and Technology, Vol.101, Oct. 1979, p. 374.

- Ostergren, WJ and Krempl, E, “A Uniaxial Damage Accumulation Law for Time-Varying Loading Including Creep-Fatigue Interaction”, Journal of Pressure Vessel Technology, Vol.101, May 1979, p. 118.
- Ostergren, WJ and Krempl, E, “A Linear Uniaxial Damage Accumulation Law for Creep-Fatigue Interaction”, Joint ASME/CSME Pressure Vessel & Piping Conference, Montreal, Canada, Mar. 1978.
- Ostergren, WJ, “Correlation of Hold Time Effects in Elevated Temperature Low-Cycle Fatigue Using a Frequency Modified Damage Function”, ASME-MPC Symposium on Creep-Fatigue Interaction, Dec. 1976, p. 179.
- Ostergren, WJ, “A Damage Function and Associated Failure Equations for Predicting Hold-Time and Frequency Effects in Elevated Temperature, Low-Cycle Fatigue”, Journal of Testing and Evaluation, Vol.4, Sept. 1976, p. 327.
- Levy, N; Marcal, PV; Ostergren, WJ and Rice, JR, “Small Scale Yielding Near a Crack in Plane Strain: A Finite Element Analysis”, International Journal of Fracture Mechanics, Vol.7, June 1971, p. 143.

BOOK PUBLICATIONS

- Ostergren, WJ and Whitehead, JR, Editors, “Methods for Predicting Material Life in Fatigue”, ASME Special Technical Publication, Dec. 1979.

RESEARCH INTERESTS

- Mechanics of materials
- Structural analysis
- Machine design
- Propulsion and power systems
- Program management
- Product development
- Total quality management

INSTITUTIONAL ACTIVITIES

- ASME Academic Advisor.
- Advisory Board Member for Center for Innovative Teaching and Learning (2011).
- Member of Space Utilization Committee selected by Faculty Senate (2007-2010).
- Member of Distance Education Committee selected by Faculty Senate (2007-2009).
- Member of Masters in Teaching Committee selected by Faculty Senate
- Member of Distinguished Teaching Award selection committee (2008-2009).
- Co-op advisor for students at GE and Intel.
- Invited speaker at inaugural Graduate Student Association Workshop, "Successfully Transitioning From School to the Workplace".
- Participant in Exploration Day and Research at Tech Day presentations and tours.
- Search committee member for open positions in Mechanical Engineering, Management and Humanities.

COURSES TAUGHT

- **MENG304 - Advanced Strength of Materials.** The course focuses on advanced strength of materials principles and techniques for use in mechanical engineering design and problem solving. Mechanical engineering designs are increasingly complex and require a range of mechanics skills including, predicting material failure under steady and cyclic loading, determining the stresses and deflections due to unsymmetrical loading, understanding nonlinear structural deflections and resulting residual stresses, computing shear stresses in thin-walled structures, analyzing for stresses in axisymmetric thin-walled shells, and analyzing thick cylinders. All of these important mechanics skills must be utilized by a mechanical engineer to make informed design decisions and to solve many engineering problems.
- **ES302 - Mechanics of Materials.** The course focuses on the relationships between the applied external forces acting on deformable bodies and the internal stresses and strains produced. In addition to analyzing equilibrium of the deformable bodies, this requires consideration of the material properties and geometry of deformation. Material characteristics, tension, compression, torsion, shear, bending, Mohr's circle, combined loading, and buckling of columns will be investigated. Analysis and design of structural members will be considered. The computer program MD Solids, provided with the text, will be used to help develop problem solving skills. These mechanics of materials skills are typically utilized by mechanical engineers to solve engineering problems and to make informed design decisions.
- **MENG381/382 - Junior Design Clinic.** The course enables students to utilize the engineering design and verification process on assigned mechanical design projects. Students will be advised by faculty members and external company sponsors/mentors. Weekly workshops will be conducted in specialized topics pertinent to the design process. Topics include conceptual design; design specifications; program planning using Gantt charts; costing of a project; detailed product design; as well as other specialized topics. Formal reports, fabrication drawings, and cost estimates will be prepared and submitted to faculty and outside industrial sponsors/mentors. Formal oral presentations will be given to a reviewing group of advisers and students. Formal written proposals, interim reports and final reports will be completed by the assigned student teams.
- **MENG481/482 - Senior Design Clinic.** The course will enable students to utilize the engineering design and verification process on assigned mechanical design projects. Students will be advised by faculty members and external company sponsors/mentors. Weekly workshops will be conducted in specialized topics pertinent to the design process. Topics include conceptual design; design specifications; program planning using Gantt charts; costing of a project; detailed product design; as well as other specialized topics. Formal reports, fabrication drawings, and cost estimates will be prepared and submitted to faculty and outside industrial sponsors/mentors. Formal oral presentations will be given to a reviewing group of advisers and students. Formal written proposals, interim reports and final reports will be completed by the assigned student teams.

- **MENG485 – Advanced Design Clinic.** This will enable students to enhance their understanding of the engineering design and verification process for mechanical design projects. Weekly seminars will be conducted in specialized topics pertinent to the design process. Topics will include creating a high performing team, dealing with project setbacks, common design problems to avoid, communicating within the team, dealing with project sponsors and customers, and developing a set of best practices for completing mechanical design projects. Students will also be participants of ongoing design project teams, contributing in the role of senior technical member and/or adviser. Students will contribute to the formal reports and oral presentations of these teams.
- **EMGT506 - Managing Technology Resources.** This course covers the vital role provided by modern engineering managers and encompasses a variety of critical skills, including managing people and projects, providing team leadership, making decisions, resolving conflicts, interfacing with customers, and making technical proposals. All of these important capabilities must be utilized by the technical manager in today's dynamic engineering environment where products and processes are continuously improving.
- **EMGT572 - Engineering Statistics.** The course focuses on statistical decision making in today's dynamic engineering environment where products and processes are continuously improving. Decisions by modern engineering managers are increasingly data driven and require a range of statistical skills including, gathering and describing data, designing samples and experiments, drawing statistical inferences and conclusions, evaluating the confidence of conclusions, developing regression models for anticipating future behavior and use of statistical quality control and six sigma to drive process improvement. All of these important capabilities must be utilized by a technical manager to make informed decisions.
- **MENG504 - Advanced Mechanics of Materials.** The course focuses on advanced strength of materials principles and techniques for use in mechanical engineering design and problem solving. Mechanical engineering designs are increasingly complex and require a range of mechanics skills including, predicting material failure under steady and cyclic loading, determining the stresses and deflections due to unsymmetrical loading, understanding nonlinear structural deflections and resulting residual stresses, computing shear stresses in thin-walled structures, analyzing for stresses in axisymmetric thin-walled shells and thick cylinders and predicting the stability of elastic beams and shells. All of these important mechanics skills must be utilized by a mechanical engineer to make informed design decisions and to solve many engineering problems.

Donghyeon Ryu, Ph.D., E.I.T.

Director of Laboratory for Smart Materials and Structures (LaSMaS)

Assistant Professor of Mechanical Engineering

New Mexico Institute of Mining and Technology

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E-mail: dryu@nmt.edu

Website: www.nmt.edu/~dryu

PROFESSIONAL PREPARATION:

Yonsei University, Seoul, South Korea Civil and Environmental Engineering B.S. (2004)

Yonsei University, Seoul, South Korea Civil Engineering M.S. (2008)

University of California, Davis Mechanical and Aerospace Engineering M.S. (2014)

University of California, Davis Civil and Environmental Engineering Ph.D. (2014)

APPOINTMENTS:

2014-present: Tenure-Track Assistant Professor, Department of Mechanical Engineering
New Mexico Institute of Mining and Technology, Socorro, NM

AWARDS:

2013 Best Paper Award in Adaptive Structures and Material Systems, American Society of Mechanical Engineers (ASME)

2013 First Place, Student Best Paper Award at 9th International Workshop on Structural Health Monitoring (9IWSHM), sponsored by DEStech Publications

2013 Best Paper Award at 10th International Conference on Damage Assessment of Structures (DAMAS), sponsored by Institute of Physics Publishing

2013 Summer Graduate Student Researcher Award, University of California, Davis

2013-2014 UCD & Humanities Graduate Research Award, University of California, Davis

2012 Summer Graduate Student Researcher Award, University of California, Davis

2011 Summer Graduate Student Researcher Award, University of California, Davis

2011-2012 UCD & Humanities Graduate Research Award, University of California, Davis

2009-2014 Five-Year Graduate Fellowship, College of Engineering, University of California, Davis

2006-2008 Brain Korea (BK) 21 Fellowship, Korea Research Foundation

2005 Commendation for Meritorious Performance in Supervising a Bathhouse Construction, Brigade Commander, 30th Mechanized Infantry Division, Republic of Korea Army

2005 Commendation for Meritorious Performance in Air-Ground Integration Training, Brigade Commander, 30th Mechanized Infantry Division, Republic of Korea Army

2000-2003 Several Merit-Based Scholarships, Yonsei University, Seoul, South Korea

JOURNAL PUBLICATIONS (* REFERS CORRESPONDING AUTHOR):

1. **D. Ryu** and K.J. Loh*, 2014, "Multi-modal Sensing using Photoactive Thin Films," *Smart Materials and Structures*, **23**(085011): 1-16.
2. **D. Ryu**, F.N. Meyers, and K.J. Loh*, 2014, "Inkjet-printed, Flexible, and Photoactive Thin Film Strain Sensors," *Journal of Intelligent Material Systems and Structures*, 1-12.
3. **D. Ryu** and K.J. Loh*, 2013, "Analyzing the Strain Sensing Response of Photoactive Thin Films using Absorption Spectroscopy," *Key Engineering Materials Journal*, **569-570**: 695-701.

4. L.P. Mortensen, **D. Ryu**, Y. Zhao, and K.J. Loh*, 2013, "Rapid Assembly of Multifunctional Thin Film Sensors for Wind Turbine Blade Monitoring," *Key Engineering Materials Journal (1013-9826)*, Trans-Tech, **569-570**: 512-522. **[2013 DAMAS Best Paper]**
5. L. Arronche, K. Gordon, **D. Ryu**, V. La Saponara*, and L. Cheng*, 2013, "Investigation of Galvanic Corrosion between AISI 1018 Carbon Steel and CFRPs Modified with Multi-walled Carbon Nanotubes," *Journal of Materials Science*, **48(3)**: 1315-1323.
6. **D. Ryu** and K.J. Loh*, 2012, "Strain Sensing using Photocurrent Generated by Photoactive P3HT-based Nanocomposites," *Smart Materials and Structures*, **21(065017)**: 1-9. **[2013 ASME Best Paper in Adaptive Structures and Material Systems]**
7. **D. Ryu**, K.J. Loh*, R. Ireland, M. Karimzada, F. Yaghmaie, and A. Gusman, 2011, "In Situ Reduction of Gold Nanoparticles in PDMS Matrices and Applications for Large Strain Sensing," *Smart Structures and Systems*, **8(5)**: 471-48.
8. H.J. Lim, **D. Ryu***, J.H. Won, and M.K. Kim, 2008, "Nonlinear Dynamic Behavior of Temporary Rail Considering the Effect of Vibration," *Korean Society of Civil Engineers (KSCE) Journal of Civil Engineering (1015-6348)*, KSCE, **28(2A)**: 171-178.

CONFERENCE PUBLICATIONS (* REFERS CORRESPONDING AUTHOR):

1. **D. Ryu***, N. Castaño, and K. Vedera, 2015, "Mechanoluminescent Composites Towards Autonomous Impact Damage Detection of Aerospace Structures," *Proceedings of the 10th International Workshop on Structural Health Monitoring*, Stanford, CA, September 1-3, 2015.
2. **D. Ryu***, M. Romero, and R. Stoer, 2015, "Thermo-, Chemo-, and Mechano-Optical Characterization of Multi-Modal Tensile Strain and pH Sensing Thin Films," *Proceedings of the 6AESE/11ANCRiSST 2015 Joint Conference*, Urbana, IL, August 1-2, 2015.
3. **D. Ryu** and K.J. Loh*, 2014, "Multifunctional Self-sensing Structural Coatings with Patterned Electrodes," *Proceedings of the 6th World Conference on Structural Control and Monitoring (6WCSCM)*, Barcelona, Spain, July 15-17, 2014.
4. **D. Ryu** and K.J. Loh*, 2014, "Photoactive and Self-sensing P3HT-based Thin Films for Strain and Corrosion Monitoring," *Proceedings of SPIE – 21st Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 9-13, 2014.
5. **D. Ryu** and K.J. Loh*, 2013, "Characterizing the Self-sensing Properties of Photoactive P3HT-based Nanocomposites," *Proceedings of the 9th International Workshop on Structural Health Monitoring*, Stanford, CA, September 10-12, 2013.
6. **D. Ryu** and K.J. Loh*, 2012, "Self-sensing Photoactive Thin Films for Monitoring Space Structures," *Proceedings of the ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS)*, Stone Mountain, GA, September 19-21, 2012.
7. R. Ireland, **D. Ryu**, M. Karimzada, K.J. Loh*, A. Gusman, and F. Yaghmaie, 2011, "Multifunctional Strain and Chemical Sensing using Gold Nanoparticle-based Polymer Composites," *Proceedings of the 2011 International Conference on Smart Structures and Systems (ICOSSS)*, Seoul, South Korea, September 18-22, 2011.
8. **D. Ryu** and K.J. Loh*, 2011, "A Bio-Inspired Nanocomposite for Photocurrent-based Strain Sensing," *Proceedings of the 8th International Workshop on Structural Health Monitoring*, Stanford, CA, September 13-15, 2011.
9. **D. Ryu**, K.J. Loh*, and F. Yaghmaie, 2011, "Validation of Photocurrent-based Strain Sensing using a P3HT-based Nanocomposite," *Proceedings of SPIE – 18th Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 6-10, 2011. **[SPIE Travel Grant Recipient]**
10. **D. Ryu**, K.J. Loh*, and F. Yaghmaie, 2011, "Towards the Development of Photosynthesis-Inspired P3HT-based Nanocomposite Sensors," *Proceedings of the 2011 National Science Foundation CMMI Research and Innovation Conference*, Atlanta, GA, January 4-7, 2011. **[National Science Foundation Student Participation Grant Recipient]**

11. **D. Ryu**, M.K. Kim*, G. Kim, and J.H. Won, 2009, "A Study on the Characteristic of a Skewed Bridge to the Seismic Motion using Time History Analysis," *Proceedings of the 35th Korean Society of Civil Engineers (KSCE) Annual Conference*, Gangwon, South Korea, October 21-23, 2009.
12. **D. Ryu**, K.S. Park, H.S. Ju, and M.K. Kim*, 2008, "A Study on Application of Combination Rules Involving Skewed Bridges for Response Spectrum Analysis," *Proceedings of the 2008 International Conference on Advances in Structural Engineering & Mechanics (ASEM)*, Jeju, South Korea, May 26-28, 2008.
13. **D. Ryu**, M.G. Shin, J.W. Park, and M.K. Kim*, 2008, "A Study on Comparison of Combination Rules for the Seismic Analyses on Curved Bridges with the Different Radiuses of Curvature," *Proceedings of the 2008 Computational Structural Engineering Institute of Korea (COSEIK) Annual Conference*, Seoul, South Korea, April 17-18, 2008.
14. K.S. Park, H.S. Ju, **D. Ryu**, and M.K. Kim*, 2008, "Comparison of Minimum Seat Length Requirements," *Proceedings of the 2008 Earthquake Engineering Society of Korea (EESK) Annual conference*, Seoul, South Korea, March 21, 2008.
15. J.H. Won, M.K. Kim*, S.U. Choi, M.H. Park, and **D. Ryu**, 2008, "A Case Study of Exposed River Crossing Pipelines Encased in Concrete Box," *Proceedings of the 1st International Conference on Modern Design, Construction and Maintenance of Structures*, Hanoi, Vietnam, December 10-11, 2007.
16. J.H. Won, M.K. Kim*, and **D. Ryu**, 2007, "Characteristics of an Encased Gas Transportation Pipeline in Offshore Application," *Proceedings of the 7th International Offshore and Polar Engineering Conference (ISOPE)*, Lisbon, Portugal, July 1-6, 2007.

BOOK CONTRIBUTIONS (* REFERS CORRESPONDING AUTHOR):

1. K. J. Loh*, **D. Ryu**, and B. M. Lee, 2015, "Bio-inspired Sensors for Structural Health Monitoring," *Biotechnologies and Biomimetics for Civil Engineering* (ed. F. P. Torgal, J. A. Labrincha, M. V. Diamanti, C. P. Yu, and H. K. Lee), Springer.
2. K. J. Loh* and **D. Ryu**, 2014, "Multifunctional Materials and Nanotechnology for Assessing and Monitoring Civil Infrastructures," *Sensor Technologies for Civil Infrastructure, Volume 1: Sensing Hardware and Data Collection Methods for Performance Assessment* (ed. M. L. Wang, J. P. Lynch, and H. Sohn), Woodhead Publishing.

ORAL PRESENTATIONS:

1. "Reduced Order Non-Linear Structural Model," College of Excellence (COE) *Commercial Space Transportation (CST) Fifth Annual Technical Meeting*, Arlington, VA (October 27, 2015).
2. "Fracto-Mechanoluminescent EuD₄TEA-PDMS Composites Towards Autonomous Damage Detection," *The 27th Rio Grande Symposium on Advanced Materials*, Albuquerque, NM (October 2, 2015).
3. "Characterization of Fracto-Mechanoluminescent EuD₄TEA-PDMS Composites under High-Speed Compressive Loading," *10th International Workshop on Structural Health Monitoring*, Stanford, CA (September 1, 2015)
4. "Multiphysics Analysis of Multi-Modal Tensile Strain and pH Sensing Thin Films," *2015 Joint Conference 6AESE/11ANCRiSST*, Urbana, IL (August 1, 2015).
5. "Multi-modal, Self-sensing, and Photoactive Structural Coatings for Sustainable Infrastructures," *Engineering Institute Lecture Series, Los Alamos National Laboratory*, Los Alamos, NM (May 12, 2015).
6. "Characterization of the Multi-Modal Sensing Properties of Photoactive Structural Coatings," *SPIE – 22nd Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, (March 9, 2015).

7. "Multi-modal, Self-sensing, and Photoactive Structural Coatings for Sustainable Infrastructures," *Department of Materials and Metallurgical Engineering, New Mexico Institute of Mining and Technology*, Socorro, NM (February 13, 2015).
8. "Multi-modal, Self-sensing, and Photoactive Structural Coatings for Sustainable Infrastructures," *Department of Mechanical Engineering, New Mexico Institute of Mining and Technology*, Socorro, NM (September 23, 2014).
9. "Multi-modal and Self-sensing using Photoactive Structural Coatings," *Department of Mechanical Engineering, New Mexico Institute of Mining and Technology*, Socorro, NM (July 25, 2014).
10. "Multimodal Self-sensing Structural Coatings with Patterned Electrodes", *6th World Conference on Structural Control and Monitoring*, Barcelona, Spain, (July 15, 2014).
11. "Multifunctional Structural Coating for Sustainable Infrastructures," *Department of Civil and Environmental Engineering, Yonsei University*, Seoul, South Korea (June 30, 2014).
12. "Multifunctional Structural Coating for Sustainable Infrastructures," *Department of Civil and Environmental Engineering, KAIST*, Daejeon, South Korea (June 24, 2014).
13. "Photoactive Structural Coating for Sustainable Infrastructure," *Department of Civil, Construction, and Environmental Engineering, University of Alabama at Birmingham*, Birmingham, AL (April 11, 2014).
14. "Photoactive Thin Films for Strain and Corrosion Monitoring," *SPIE – 21st Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, (March 12, 2014).
15. "Multifunctional Structural Coating for Multimodal Damage Detection," *Department of Civil and Environmental Engineering, Virginia Polytechnic Institute and State University*, Blacksburg, VA (January 16, 2014).
16. "Light Wavelength-sensitive Photoactive Nanocomposites for Selective and Multi-modal Sensing," *2013 ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Snowbird, UT, (September 16, 2013).
17. "Scalable Fabrication of Multifunctional Photoactive Sensing Thin Films," *2013 Interdisciplinary Graduate and Professional Symposium (IGPS)*, Davis, CA, (April 5, 2013).
18. "Multifunctional and Self-sensing P3HT-Carbon Nanotube Thin Films," *2012 US-Korea Conference (UKC) on Science, Technology, and Entrepreneurship*, Los Angeles, CA, (August 11, 2012). **[Student and Postdoc Program Participation Grant Recipient]**
19. "Multifunctional Strain and Chemical Sensing using Gold Nanoparticle-based Polymer Composites," *2011 International Conference on Smart Structures and Systems*, Seoul, South Korea, (September 19, 2011).
20. "Validation of Photocurrent-based Strain Sensing using a P3HT-based Nanocomposite," *SPIE – 18th Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, (March 7, 2011).
21. "A Study on Application of Combination Rules Involving Skewed Bridges for Response Spectrum Analysis," *2008 International Conference on Advances in Structural Engineering & Mechanics*, Jeju, South Korea, (May 28, 2008).
22. "A Study on Comparison of Combination Rules for the Seismic Analyses on Curved Bridges with the Different Radiuses of Curvature," *2008 Computational Structural Engineering Institute of Korea Annual Conference*, Seoul, South Korea, (April 17, 2008).

CONFERENCE POSTER PRESENTATIONS:

1. "Multi-modal and Self-sensing using Photoactive Thin Films and Light," *2013 9th International Workshop on Structural Health Monitoring*, Stanford, CA, September 10, 2013. **[UC Davis Graduate Student Travel Award Recipient]**

2. "Strain Self-sensing Validation for Flexible P3HT-MWNTs Thin Film Sensors," *2012 Interdisciplinary Graduate and Professional Symposium*, Davis, CA, April 26, 2012.
3. "Validation of Strain Sensing towards Flexible P3HT-MWNT Thin Film Sensors," *SPIE – 19th Annual International Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 13-14, 2012.
4. "Self-sensing Poly(3-hexylthiophene)-based Structural Coatings Inspired by Photosynthesis," *2011 US-Japan Workshop on Bio-Inspired Engineering of Next-Generation Sensors and Actuators*, Berkeley, CA, November 12-13, 2011. **[National Science Foundation Student Participation Grant Recipient]**
5. "A Self-Powered New Sensor Technology towards Zero Energy Consumption," *2012 Berkeley Energy & Resources Collaborative (BERC) Energy Symposium*, Berkeley, CA, October 20, 2011.
6. "Strain Sensing using Photocurrent Generated by a Carbon Nanotube-P3HT Thin Film," *SPIE – 18th Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA, March 8-9, 2011.
7. "Towards the Development of Photosynthesis-Inspired Carbon Nanotube-P3HT-based Nanocomposite Sensors," *2011 National Science Foundation CMMI Research and Innovation Conference*, Atlanta, GA, January 4-7, 2011.
8. "Synthesis and Characterization of P3HT-based Thin Films for Photocurrent Generation and Sensing Applications," *2011 National Science Foundation CMMI Research and Innovation Conference*, Atlanta, GA, January 4-7, 2011.

TRAVEL GRANTS AND AWARDS:

- 2013 UC Davis Graduate Student Travel Award, *2013 9th International Workshop on Structural Health Monitoring*, Stanford, CA (September 2013).
- 2012 Student and Postdoc Program Participation Grant, *2012 US-Korea Conference on Science, Technology, and Entrepreneurship*, Los Angeles, CA (August 2012).
- 2011 National Science Foundation Student Participation Grant, *2011 US-Japan Workshop on Bio-Inspired Engineering of Next-Generation Sensors and Actuators*, Berkeley, CA (November 2011).
- 2011 SPIE Student Travel Grant, *SPIE – 18th Annual Symposium on Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring*, San Diego, CA (March 2011).
- 2011 National Science Foundation Student Participation Grant, *2011 National Science Foundation CMMI Research and Innovation Conference*, Atlanta, GA (January 2011).
- 2010 National Science Foundation Fellowship, *2010 Micro and Nano Scale Phenomena in Tribology, NSF Summer Institute on Nanomechanics, Nanomaterials, and Micro/Nanomanufacturing*, San Diego, CA (April 2010)

CURRENT FEDERAL RESEARCH PROJECT:

1. PI (**Ryu**): COE CST Task 293 / Reduced Order Non-Linear Dynamic System Models, *Federal Aviation Administration (FAA)*. Budget: \$19,313 from 01/01/2015 to 12/31/2015.

CURRENT STATE RESEARCH PROJECT:

1. PI (**Ryu**): Multifunctional Energy Storage/Structural Materials, *Los Alamos National Laboratory, Department of Energy (DoE)*. Budget: \$2,000 from 10/01/2015 to 05/31/2016.

CURRENT INTERNAL RESEARCH PROJECT:

1. PI (**Ryu**); Co-PIs (Kimberley and Chowdhury): Interdisciplinary Research on Developing Autonomous Mechanoluminescent Composites for Autonomous Damage Detection,

Hispanic Serving Institute (HSI)-STEM, United States Department of Education (USDE).
Budget: \$10,000 from 10/01/2015 to 09/30/2016.

PENDING FEDERAL RESEARCH PROJECT:

1. **PI (Ryu);** Co-PI (Kimberley): Multiphysics Analysis of Mechanoluminescent Elastomeric Composites under High-Speed Loadings, *National Science Foundation (NSF)*. Budget: \$356,327 from 01/01/2016 to 12/31/2018.
2. PI (Bakhtiyarov); Co-PI (**Ryu**): A Self-Healing Crosslinking Nano-Composite Material for Mitigating Wellbore CO₂ Leakage, *Department of Energy (DoE)*. Budget: \$796,086 from 10/01/2015 to 9/30/2018.

PROFESSIONAL ACTIVITIES:

- Symposium Co-Chair: Structural Health Monitoring (*Sept. 2016*)
The ASME 2016 Conference on Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS2016), Stowe, VT
- Special Session Co-Organizer: Multifunctional Materials (*Sept. 2015*)
10th International Workshop on Structural Health Monitoring (10IWSHM), Stanford, CA
- National Science Foundation (NSF) Panel Reviewer (*May 2015*)
Directorate of Engineering (ENG), Division of Civil, Mechanical, Manufacturing Innovation (CMMI), Arlington, VA
- Technical Program Committee Member (*2013 – present*)
American Society of Mechanical Engineers, Adaptive Structures and Material Systems Branch

PROFESSIONAL AND COMMITTEE MEMBERSHIPS:

- Member, American Society of Civil Engineers (ASCE), *2009 – present*
- Member, American Society of Mechanical Engineers (ASME), *2013 – present*
 - Technical Committee Secretary, ASME/ASMS Branch, Structural Health Monitoring, *2015 – 2016 (expected)*
 - Technical Committee Member, ASME/ASMS Branch, Structural Health Monitoring, *2013 – present*
- Member, American Institute of Aeronautics and Astronautics (AIAA), *2014 – present*
- Member, Earthquake Engineering Research Institute (EERI), *2009 – present*
- Member, Electrochemical Society (ECS), *2012 – 2015*
- Member, Institute of Electrical and Electronics Engineers (IEEE), *2011 – present*
- Member, Korean-American Scientists and Engineers Association (KSEA), *2012 – present*
 - *Student Chair* in the *Civil & Environmental Engineering Section* for the *Sacramento Valley Chapter (SVC)/Korean-American Scientists and Engineers Association (KSEA)*, *2012 – 2013*
- Student Member, Korean Society of Civil Engineers (KSCE), *2008 – 2010*
- Student Member, Computational Structural Engineering Institute of Korea (COSEIK), *2008 – 2010*

EDITORIAL ACTIVITIES:

- Reviewer: *Frontiers in Built Environment*
- Reviewer: *IEEE Sensors Journal* (1)
- Reviewer: *Journal of Civil Engineering and Architecture* (1)
- Reviewer: *Proceedings of the IEEE* (2)
- Reviewer: *Shock and Vibration* (1)
- Reviewer: *Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS) 2015* (2)

- Reviewer: *Smart Materials and Structures* (1)
- Reviewer: *Smart Structures and Systems* (1)
- Reviewer: *Structural Control and Health Monitoring* (1)
- Reviewer: *Structural Health Monitoring* (1)

M.S. THESIS COMMITTEES (YEAR OF GRADUATION):

COMMITTEE MEMBER:

- *M.S. Thesis Committee:* Ms. Mary Anderson (*present*)
- *M.S. Thesis Committee:* Mr. Blaine Trujillo (*present*)
- *M.S. Thesis Committee:* Mr. Matthew Campisi (*present*)
- *M.S. Thesis Committee:* Mr. Shawn West (*present*)

CURRENT UNDERGRADUATE RESEARCH ASSISTANTS:

1. Mr. Nicolas Castaño (Mechanical Engineering, New Mexico Tech, 2014 – *present*)
2. Mr. Kevin Vedera (Mechanical Engineering, New Mexico Tech, 2014 – *present*)
3. Mr. Ryan Stoer (Mechanical Engineering, New Mexico Tech, 2015 – *present*)
4. Mr. Raj Bhakta (Mechanical Engineering, New Mexico Tech, 2015 – *present*)
5. Mr. Michael Romero (Mechanical Engineering, New Mexico Tech, 2015 – *present*)
6. Mr. Alex Govorov (Mechanical Engineering, New Mexico Tech, 2015)
7. Mr. Nickolas Pohl (Mechanical Engineering, New Mexico Tech, 2015)

JUNIOR/SENIOR DESIGN PROJECTS:

1. Multifunctional Mechano-Optoelectronic Composites (sponsored by HSI-STEM, *Fall 2015 – present*)
 - a. Mr. Nicolas Castaño (Mechanical Engineering, New Mexico Tech)
 - b. Mr. Raj Bhakta (Mechanical Engineering, New Mexico Tech)
 - c. Mr. Devin Hughes (Mechanical Engineering, New Mexico Tech)
 - d. Mr. Jordan Cassel (Mechanical Engineering, New Mexico Tech)
 - e. Mr. Alex Sandhorst (Mechanical Engineering, New Mexico Tech)
 - f. Mr. Drew Wilcox (Chemical Engineering, New Mexico Tech)
 - g. Mr. Kevin Reed (Chemical Engineering, New Mexico Tech)
 - h. Mr. Brian Arko (Chemical Engineering, New Mexico Tech)
 - i. Ms. Izzy Dewers (Chemical Engineering, New Mexico Tech)
 - j. Mr. Alex Lawrence (Chemical Engineering, New Mexico Tech)
2. Multifunctional Energy Storage/Structural Materials (sponsored by Los Alamos National Laboratory, *Fall 2015 – present*)
 - a. Mr. Abram Diaz-Strandberg (Mechanical Engineering, New Mexico Tech)
 - b. Ms. Laura Lane (Mechanical Engineering, New Mexico Tech)
 - c. Mr. Joey Martinez (Mechanical Engineering, New Mexico Tech)
 - d. Mr. Jared Marks (Mechanical Engineering, New Mexico Tech)
 - e. Mr. Ritchie Chicas (Mechanical Engineering, New Mexico Tech)
3. Inductrack Maglev Research Design (sponsored by Lawrence Livermore National Laboratory, *Fall 2014 – present*)
 - a. Mr. Ankit Gajurel (Mechanical Engineering, New Mexico Tech)
 - b. Ms. Rebecca Runnels (Mechanical Engineering, New Mexico Tech)
 - c. Ms. Yuhe Chang (Mechanical Engineering, New Mexico Tech)
 - d. Mr. Nicholas Pohl (Mechanical Engineering, New Mexico Tech)
 - e. Ms. Michelle Mwei (Mechanical Engineering, New Mexico Tech)
 - f. Mr. Ryan Rose (Mechanical Engineering, New Mexico Tech)
4. SpaceX Hyperloop Capsule (*Fall 2015 – present*)
 - a. Mr. Lukas Gabert (Mechanical Engineering, New Mexico Tech)

- b. Mr. Evan Prichard (Mechanical Engineering, New Mexico Tech)
- c. Mr. Sam Strong (Mechanical Engineering, New Mexico Tech)
- d. Mr. Steven Anichowski (Mechanical Engineering, New Mexico Tech)
- e. Mr. Dennis DeHerrera (Mechanical Engineering, New Mexico Tech)
- f. Mr. Daniel Barnhouse (Mechanical Engineering, New Mexico Tech)

TEACHING ACTIVITIES:

- Instructor, MENG 589/MATE 530 – Design and Analysis of Experiments (grad, New Mexico Tech)
 - Fall 2015
- Instructor, MENG 304 – Advanced Strength of Materials (undergrad, New Mexico Tech)
 - Spring/Fall 2015 and Fall 2014
- Instructor, MENG 504 – Advanced Mechanics of Materials (grad, New Mexico Tech)
 - Spring 2015
- Instructor, MENG 585 – Graduate-Faculty Seminar (grad, New Mexico Tech)
 - Fall 2014
- Teaching assistant, ENG 104 & Lab – Mechanics of Materials (undergrad, UC Davis)
 - Spring 2013 - ENG 104L; Spring 2011, Winter 2011, and Spring 2010 - ENG 104
- Teaching assistant, ECI 138 – Structural Dynamics (undergrad, UC Davis)
 - Winter 2013
- Teaching assistant, CEE 2101 – Mechanics of Solid Materials (undergrad, Yonsei University)
 - Spring 2008
- Teaching assistant, CEE 3303 – Applied Mechanics (undergrad, Yonsei University)
 - Fall 2007

COLLABORATORS WITHIN PAST 48 MONTHS:

- Sayavur Bakhtiyarov (Mechanical Engineering, New Mexico Tech)
- Lijuan “Dawn” Cheng (Civil & Environmental Engineering, UC Davis)
- Sanchari Choudhury (Chemical Engineering, New Mexico Tech)
- Vincent Crespi (Physics, Penn State University)
- James Hone (Mechanical Engineering, Columbia University)
- Valeria La Saponara (Mechanical & Aerospace Engineering, UC Davis)
- Jamie Kimberley (Mechanical Engineering, New Mexico Tech)
- Kenneth J. Loh (Structural Engineering, UC San Diego)
- Ivan Lopez-Hurtado (Engineering Department, Northern New Mexico College)
- Jerome P. Lynch (Civil & Environmental Engineering, University of Michigan)
- Vishal R. Mehta (Mechanical Engineering, Northern New Mexico College)
- Igor Sevostianov (Mechanical & Aerospace Engineering, New Mexico State University)
- Hoon Sohn (Civil & Environmental Engineering, KAIST, Daejeon, South Korea)
- Mehran Tehrani (Mechanical Engineering, University of New Mexico)
- Ming L. Wang (Civil & Environmental Engineering, Northeastern University)
- Yang Wang (Civil & Environmental Engineering, Georgia Institute of Technology)
- Frank Yaghmaie (Chemical Engineering and Materials Science, UC Davis)
- Andrei Zagrai (Mechanical Engineering, New Mexico Tech)

PH.D. THESIS ADVISOR:

Kenneth J. Loh, Associate Professor, Structural Engineering, University of California, San Diego

Tie Wei

114 Weir Hall
801 Leroy PL, Socorro, NM 87801
Office: 575-835-6764
twei@nmt.edu

Education

- University of Utah**, Salt Lake City, Utah 2004
Ph. D., Mechanical Engineering
Dissertation: One-Dimensional Turbulence Modeling of Turbulent Wall Bounded Flows.
Advisor: Professor Patrick McMurtry
- East China University of Science and Technology**, Shanghai, China 1996
M.S., Mechanical Engineering
- Shanghai Jiaotong University**, Shanghai, China 1993
B.S., Mechanical Engineering

Experience

- Assistant Professor** 2013-current
Visiting Assistant Professor 2012-2013
New Mexico Institute of Mining and Technology
- Developed and taught courses on introduction to computational fluid dynamics, fluid mechanics, and advanced heat transfer. Mentored students in aerospace propulsion course.
 - Investigating the mixing of fluids with different viscosities.
 - Investigating flow mechanisms within low permeability media such as shale gas/oil reservoirs.
 - Investigating flow patterns in aerosol deposition method.
 - Investigating the effects of interface shape on explosive welding.
 - Investigating the end-wall effects in Taylor-Couette flow.
 - Investigating Flettner-rotor for wind-assisted propulsion.
 - Investigating the potential wind power on US road systems.
- Postdoctoral Research Associate** 2009-2012
Los Alamos National Laboratory, NM
- Performed high resolution direct numerical simulation of Rayleigh-Taylor instability (RTI) on supercomputers, including some of the largest clusters in the world, and compared results with experimental measurements. The study has led to the discovery of important and unexpected physics.
 - Investigated the effects of tilting initial interface on Rayleigh-Taylor instability. The tilting interface RTI involves complex turbulence production mechanisms, and constitutes a novel and important test case for turbulence modeling.
- Postdoctoral Research Associate** 2005-2009
Department of Mechanical Engineering, The Pennsylvania State University, PA
- Developed a direct numerical simulation code, using spectral method, to investigate decaying homogeneous isotropic turbulence.

- Conducted numerical and theoretical analysis of aliasing error from nonlinear terms in different forms: advection form, divergence form, rotational form and skew-symmetric form.
- Applied and enhanced a synthetic field-type surface model in large-eddy simulation (LES) of high Reynolds number wall-bounded flows.
- Conducted numerical and theoretical analysis of the near-surface region in LES of high Reynolds number, shear-dominated turbulent flows, discovered the underlying mechanism that causes the poor performance of eddy-viscosity models in the near-surface region.
- Devised a methodology to improve accuracy in LES of wall-bounded flows.
- Investigated an anisotropic subfilter-scale model for LES.
- Conducted numerical and theoretical studies of flows with multiple physical processes.
- Conducted numerical experiments to study the effects of polymer drag reduction on turbulent structures.

Research Assistant

Department of Mechanical Engineering, University of Utah, Utah 1998-2004

- Investigated scalar mixing in a turbulent pipe flow using a stochastic mixing model called Linear Eddy Model.
- Implemented and improved a one-dimensional phenomenological turbulence model to study turbulent channel flow and spatially developing turbulent boundary layer flow.
- Developed a new theory for the structures of turbulent wall-bounded flows in collaboration with Drs. Fife, Klewicki and McMurtry.
- Discovered the intrinsic hierarchy of ‘scaling layers’ in the stress gradient balance region, providing a mathematical interpretation for the law of the wall in turbulent wall-bounded flows.
- Identified a new scaling for heat transfer in turbulent wall-bounded flows which collapsed experimental data much better than previous theory.

Teaching Assistant

Department of Mechanical Engineering, University of Utah, Utah 1998-1999

- Served as TA for under-graduate fluid mechanics course. Duties included preparing laboratory handouts, giving one-hour lecture about experiments for 30 students, setting up and supervising laboratory sessions, grading laboratory reports.

Engineer

Asia Simulation Co., Zhuhai, China 1996-1998

- Conducted simulation of heat/mass transfer processes in a coal-burning power plant.
- Provided pre-sales support of the company products, trained more than 30 customers in the use of simulation software; answered customers’ technical questions.
- Drafted proposals for numerical simulation of a power plant combustion system.
- Assisted in the installation of our company’s local area networks with more than 100 computers.

Awards and Honors

- “Physics of Fluid”: Award and Invited Paper (2010).
- “Los Alamos Postdoctoral Research Day”: Outstanding Poster Award (2011).

Professional Affiliations

- Member, American Society of Mechanical Engineering.
- Member, American Physical Society.

Computer Skills

- Application Software: ANSYS, FLUENT, OpenFOAM, Salome
- Programming languages: Fortran, C, C++, MPI, Python, MATLAB, Bash
- Operating systems: UNIX/Linux, Windows
- DOE HPC platforms: ORNL-Jaguar (~300,000 cores), LANL-Mapache, Conejos... (~4000 cores).

Professional and Community Services

- Journal reviewers: Physics of Fluids, Experiments in Fluids
- Host of Teaching Coffee Hour at New Mexico Tech, 2014-2015
- Co-founder, M-lab
- Co-founder, Society of Collegiate Inventors
- Advisor to Junior/Senior Design Projects, NMT
- Summer workshops on teaching, NMT, Aug, 2014
- Judge: Rube Goldberg Competition, NMT, Feb 15, 2014.
- Judge: Rube Goldberg Competition, NMT, Feb 16, 2013.
- Committee member: New Mexico Tech Computing on Campus, 2012-2014.
- Undergraduate advisor: New Mexico Tech, 2013.
- Advisor to Senior Design Project: New Mexico Tech, 2013.
- Faculty development workshop on Active Learning Techniques, August 2013
- Committee member: Los Alamos National Laboratory Postdoctoral Association.
- Judge: Los Alamos National Laboratory Student Symposium, Apr 23, 2012.

Teaching Responsibilities

- 2014: Engineering fluid dynamics, Computational fluid dynamics, Advance heat transfer
- Fall 2013: Engineering fluid dynamics, Computational fluid mechanics and reaction (NMT)
- Spring 2013: Engineering fluid dynamics; Advanced heat transfer (NMT).
- Fall 2012: Introduction to computational fluid dynamics; Aerospace propulsion (NMT).

Advising

- Steve Bayley, Master degree in mechanical engineering (2013-2015)
- Mitchell Powell, Master degree in mechanical engineering (2012-2014)
- Daniel Archuleta, Student work (2014-2015)
- Darien Williams, Student research (summer 2014)
- Jason Lee, undergraduate student research (2013-2015)

Funding/Research Proposals

- Osmotic Power Development, New Mexico EPScor, co-PI (2013-)
- ES491-Collaborative Senior Design Capstone Project-Magnetic Refrigeration, PI, \$5,000 (2015)
- Plastic Part Slicer for Los Alamos National Laboratory, PI, \$2,000 (2015)
- ES491-Collaborative Senior Design Capstone Project-Reflective insulator, PI, \$5,000 (2014)

- Composite Overwrapped Pressure Vessel for Los Alamos National Laboratory, PI, \$5,000 (2014)
- Federal College Work Study (Daniel Archuleta): \$3,500 (2014)
- New Mexico Alliance for Minority Participation (New Mexico AMP) Undergraduate Research Assistance (Jason Lee): \$1,250 (2014)
- New Mexico Alliance for Minority Participation (New Mexico AMP) Undergraduate Research Assistance (Jason Lee): \$1,250 (2013)
- “Wind-assisted Propulsion: Optimal Design of Flettner-Rotor to Propel Road Vehicles,” Proposal to American Public Power Association (PI).
- “Mixing characteristics among fluids with different viscosities,” Los Alamos National Laboratory.
- “Kinetics and Turbulence in chem/bio defeat,” Proposal to DTRA PerC (Co-PI).
- “Flow patterns and bonding mechanism in aerosol deposition method,” Proposal to NSF Materials Processing and Manufacturing (in preparation, Co-PI).
- “Flow mechanism in shale oil/gas reservoirs,” Proposal to DoE (PI).

Peer Reviewed Journal Publications

- T. Wei and J. Ford, “Enhancing the Connection to Undergraduate Engineering Students: A Hands-on and Team-Based Approach to Fluid Mechanics”, *Journal of STEM education*, Vol 16, No2, 2015.
- J. Ford and T. Wei, “Quad charts in the classroom to reinforce technical communication fundamentals”, *Journal of technical writing and communication*, Vol 45, No 3, 2015.
- M. Andrews, D. Youngs, D. Livescu and T. Wei “Computational studies of two-dimensional Rayleigh-Taylor driven mixing for a tilted-rig” *Journal of Fluid Engineering*, Vol 136, 091212, (2014).
- S. Saha, J. Klewicki, A. Ooi, H. Blackburn, and T. Wei “Scaling properties of the equation for passive scalar transport in wall-bounded turbulent flows” *International Journal of Heat and Mass Transfer*, Vol 70, (2014).
- T. Wei and D. Livescu “Late-time quadratic growth in single-mode Rayleigh-Taylor instabilities.” *Physical Review E* 86, 046405 (2012).
- D. Livescu, T. Wei and M. Petersen “Direct Numerical Simulation of Rayleigh-Taylor Instability.” *Journal of Physics: Conference series* 318, 082007 (2011).
- J. Brasseur and T. Wei “Designing large-eddy simulation of the turbulent boundary layer to capture law-of-the-wall scaling.” *Physics of Fluids* 22, 021303 (2010).
- J. Klewicki, P. Fife and T. Wei “On the logarithmic mean profile.” *J. Fluid Mech.* 638:73-93 (2009).
- P. Fife, J. Klewicki and T. Wei “Time averaging in turbulence settings may reveal an infinite hierarchy of length scales.” *Discrete and Continuous Dynamical Systems* 24 (2009).
- T. Wei, P. Fife and P. McMurtry “On scaling the mean momentum balance and its solutions in turbulent Couette-Poiseuille flow.” *J. Fluid Mech.* 573: 371-398 (2007).

- J. Klewicki, P. McMurtry, P. Fife and T. Wei “A physical model of the turbulent boundary layer consonant with the structure of the mean momentum balance.” *Phil. Trans. R. Soc. A* 365: 823-839 (2007).
- J. Klewicki, P. Fife, T. Wei and P. McMurtry “Overview of a Methodology for Scaling the Indeterminate Equations of Wall Turbulence.” *AIAA J.* 44: 2475-2481 (2006).
- P. Fife, T. Wei, J. Klewicki and P. McMurtry “Stress-gradient-balance layers and scale hierarchies in wall-bounded turbulent flows.” *J. Fluid Mech.* 532: 165-189 (2005).
- T. Wei, P. Fife, J. Klewicki and P. McMurtry “Properties of the mean momentum balances in turbulent boundary layers, pipe and channel flows.” *J. Fluid Mech.* 522: 303-327 (2005).
- P. Fife, J. Klewicki, P. McMurtry and T. Wei “Multiscaling in the presence of indeterminacy: wall-induced turbulence.” *Multiscale Model. Simul.* 4: 936-959 (2005).
- T. Wei, Schmidt R. and P. McMurtry “Comment on the ‘Clauser-chart’ method to compute friction velocity.” *Experiments in Fluids* 38: 695-699 (2005).
- T. Wei, P. McMurtry, J. Klewicki and P. Fife “Meso-scaling of Reynolds shear stress in turbulent channel and pipe flow.” *AIAA J.* 43: 2350-2353 (2005).
- T. Wei, P. Fife, J. Klewicki and P. McMurtry “Scaling heat transfer in fully developed turbulent channel flow.” *International Journal of Heat and Mass Transfer* 48: 5284-5296 (2005).

Journal Articles in Preparation

- D. Livescu, T. Wei and M. Petersen “Turbulent mixing in Rayleigh-Taylor instability: from inertial confined fusion to supernovae.” (In preparation for *Nature Physics*)
- T. Wei and D. Livescu “Direct numerical simulation of tilted Rayleigh-Taylor instabilities.” (In preparation for *J. Fluid Mech.*)
- T. Wei and D. Livescu “Effect of Atwood number on single-mode Rayleigh-Taylor instability.” (In preparation for *Physics of Fluids*)

Selected Proceedings

- T. Wei and D. Livescu, 2014 “New findings on the growth of Single-mode Rayleigh-Taylor Instability,” 17th U.S. National Congress on Theoretical and Experimental Mechanics.
- T. Wei and D. Livescu, 2012 “Direct Numerical Simulation of Rayleigh-Taylor instability.” *Theory, Simulation, and Computation Directorate Science Highlight*. Los Alamos National Lab.
- T. Wei and D. Livescu, 2011 “The effects of initial conditions on single- and two-mode Rayleigh-Taylor instability.” *Theory, Simulation, and Computation Directorate Science Highlight*. Los Alamos National Lab.
- T. Wei and D. Livescu, 2011 “The effects of initial conditions on single- and two-mode Rayleigh-Taylor instability.” In *Proceedings of the 3rd International Conference on Turbulent Mixing and Beyond*.
- D. Livescu, T. Wei and M. Petersen, 2011 “Direct Numerical Simulation of Rayleigh-Taylor Instability.” *Journal of Physics: Conference series* 318, 082007.
- D. Livescu, M. R. Petersen, T. Wei and M. Petersen, 2010 “Turbulence and mixing characteristics in the variable density Rayleigh-Taylor mixing layer.” *Proceedings of the NECDC 2010*.

- J. Brasseur, S. Ramachandran and T. Wei, 2010 “Advances in the Design of LES to Capture Law-of-the-Wall: Role of the SFS Stress Model.” (abstract) *Bull. Amer. Phys. Soc.* 55 (16): 119.
- J. Brasseur, T. Wei and S. Ramachandran, 2009 “Predicting law-of-the-wall with LES: role of SFS and surface stress models.” (abstract) *Bull. Amer. Phys. Soc.* 54 (19): 228.
- J. Brasseur and T. Wei, 2008 “Designing Large-Eddy Simulation of High Reynolds Number Wall-bounded Flows.” (abstract) *Bull. Amer. Phys. Soc.* 53:294.
- P. Fife, T. Wei, J. Klewicki, P. McMurtry and M. Metzger, 2006 “Scaling Approaches to Wall-Induced Turbulence.” *15th U.S. National Congress on Theoretical and Applied Mechanics*, Boulder, CO.
- J. Klewicki, P. Fife, T. Wei and P. McMurtry, 2005 “Overview of a Methodology for Scaling the Indeterminate Equations of Wall Turbulence.” *4th AIAA Theoretical Fluid Mechanics Conference* (invited), Toronto.
- J. Klewicki, P. McMurtry, P. Fife and T. Wei, 2004 “A Physical Model of the Turbulent Boundary Layer Consonant with the Structure of the Mean Momentum Balance.” *Proceedings of the 15th Australasian Fluid Mechanics Conference*, University of Sydney.
- J. Klewicki, P. Fife, T. Wei and P. McMurtry, 2004 “On the Hierarchical Scaling Behaviors of Turbulent Wall-Flows.” *Perryfest*, Kingston, Ontario.

Selected Presentations

- T. Wei and D. Livescu “New findings on the growth of Single-mode Rayleigh-Taylor Instability,” *17th U.S. National Congress on Theoretical and Experimental Mechanics*, June 18, 2014
- Jason Lee, Darien Williamson, Brigitte Ek, and Tie Wei “Wind assisted propulsion using Flettner-rotor,” *The 3rd Student Research Symposium*, New Mexico Tech, 09 Apr 2014.
- Mitchell Powell and Tie Wei “Effects of gap-size and spin rate on rotating cylinders,” *The 3rd Student Research Symposium*, New Mexico Tech, 09 Apr 2014.
- Calvin Santistevan, Bryan Melchart, and Tie Wei “Fluid flow inside two rotating cylinders,” *The 3rd Student Research Symposium*, New Mexico Tech, 09 Apr 2014.
- D. Livescu and T. Wei “Turbulence characteristics in the variable-density Rayleigh-Taylor mixing layer,” *The 13th International Workshop on the Physics of Compressible Turbulent Mixing*, London, UK, 16–20 July 2012.
- T. Wei and D. Livescu “Direct Numerical Simulation of Tilted Rayleigh-Taylor Instability,” *The International Conference on Numerical Methods in Multiphase Flows*, State College, PA. June, 2012.
- T. Wei and D. Livescu “Effects of initial conditions on single and two-mode Rayleigh-Taylor Instability,” *3rd Turbulent Mixing and Beyond (TMB)*, Trieste, Italy. Aug. 2011.
- T. Wei, D. Livescu and M. Andrews “The effect of initial conditions on single and two-mode Rayleigh-Taylor Instability,” *63rd Annual Meeting of the APS Division of Fluid Dynamics*, Long Beach, CA. Nov. 2010.
- T. Wei, J. Brasseur and S. Ramachandran “Designing LES of the Atmospheric boundary layer to capture law-of-the-wall: surface stress model and the von Karman constant,” *19th Symposium on Boundary Layers and Turbulence*, Keystone, CO. August, 2009.

- T. Wei and J. Brasseur “Designing simulations to overcome the surface layer overshoot of mean shear in large eddy simulation of the neutral atmospheric boundary layer,” NCAR TOY2008 Workshop 1. Turbulence Theory and Modeling, Boulder, Co, Feb. 2008.
- T. Wei and J. Brasseur “Role of subfilter-scale model anisotropy on large-eddy simulation of the neutral atmospheric boundary layer,” 60th Annual Meeting of the Division of Fluid Dynamics, Salt Lake City, UT, Nov. 2007.
- T. Wei and J. Brasseur “Experiments on the over-prediction of mean shear in the large-eddy simulation of atmospheric boundary layer,” 59th Annual Meeting of the Division of Fluid Dynamics, American Physical Society (APS), Tampa Bay, FL, Nov. 2006.
- T. Wei and J. Brasseur “The critical importance of aliasing in near-surface large-eddy simulation,” 58th Annual Meeting of the Division of Fluid Dynamics, American Physical Society (APS), Chicago, IL, Nov. 2005.
- T. Wei “Multiscale analysis of turbulent Couette-Poiseuille flow,” 57th Annual Meeting of the Division of Fluid Dynamics, American Physical Society (APS), Seattle, WA, Nov. 2004.
- T. Wei, P. Fife, J. Klewicki and P. McMurtry “Scaling properties of the mean momentum balance in turbulent wall flows,” 56th Annual Meeting of the Division of Fluid Dynamics, American Physical Society (APS), East Rutherford, NJ, Nov. 2003.
- T. Wei, P. McMurtry and R. Schmidt “One-Dimensional Turbulence Modeling of channel flow and zero-pressure-gradient boundary layers,” 55th Annual Meeting of the Division of Fluid Dynamics, American Physical Society (APS), Dallas, Texas, Nov. 2002.

Nadir Yilmaz

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a) Profesional Preparation

Istanbul Technical University	Istanbul, Turkey	Mechanical Engineering	BS	1999
Bradley University	Peoria, IL	Mechanical Engineering	MS	2001
New Mexico State University	Las Cruces, NM	Mechanical Engineering	PhD	2005
Board of Licensure for Professional Engineers, Licence # 17412			PE	2005

b) Appointments

2015-present Associate Department Chair, Department of Mechanical Engineering, New Mexico Institute of Mining and Technology, Socorro, NM.

2006-present Associate & Assistant Professor, Department of Mechanical Engineering, New Mexico Institute of Mining and Technology, Socorro, NM.

2005-2006 College Assistant Professor, Department of Mechanical Engineering, New Mexico State University, Las Cruces, NM.

2002-2005 Instructor and Research Assistant, Department of Mechanical Engineering, New Mexico State University, Las Cruces, NM.

c) Products

(i) Significant publications

1. N. Yilmaz, F. M. Vigil, M. S., Vigil, R. Branam, G. Tolentino, W. Gill, A. B. Donaldson, "Effect of Grain Orientation on Aluminum Relocation at Incipient Melt Conditions," *Mechanics of Materials*, Vol. 88, pp. 44-49, 2015.
2. A. Atmanli, E. Ileri, B. Yuksel, N. Yilmaz, "Extensive Analyses of Diesel-Vegetable Oil-nButanol Ternary Blends in a Diesel Engine," *Applied Energy*, Vol. 145, pp. 155-172, 2015.
3. U. Demir, N.Yilmaz, G. Coskun, H. S. Soyhan, "Evaluation of Zero Dimensional Codes in Simulating IC Engines Using Primary Reference Fuel," *Applied Thermal Engineering*, Vol. 76, pp.18-24, 2015.
4. N. Yilmaz, F. M. Vigil, M. Trujillo, K. Benalil, I. A. Rodriguez, R. Jacquez, "Influence of NSF Funded Undergraduate Research Assistantships on Minority Students," 121st ASEE Annual Conference, Paper ID #10971, June 15-18, 2014, Indianapolis, Indiana.
5. N. Yilmaz, K. Benalil, F. M. Vigil, "Integration of Alternative Fuels and Turbine Research in an Undergraduate Classroom," 121st ASEE Annual Conference, Paper ID #10968, June 15-18, 2014, Indianapolis, Indiana.

(ii) Other significant publications

1. A. B. Donaldson, J. Height, W. Gill, N. Yilmaz, "Evaluation of a New Device for Simultaneous Measurement of Heat Flux and Gas Velocity in a Diffusion Flame," *Journal of Fire Sciences*, Vol. 32, No. 5, pp. 448-458, 2014.

2. N. Yilmaz, "Computational Modeling of Aluminum Particle Behavior in Rocket Propellant Fires," Proceedings of Fourth International Conference on Mathematical and Computational Applications, Paper No. 32, pp. 67-76, June 11-13, 2013, Manisa, Turkey.
3. N. Yilmaz, "Effect of Thermocouple Insertion Depth in Multiple Directions on Temperature Measurements," Journal of Fire Sciences, Vol. 30, No. 3, pp. 201-210, 2012.
4. N. Yilmaz, "Detailed CFD Modeling and Experimental Verification of Thermocouple Insertion Depth in Flames," 7th International Conference on Computational Heat and Mass Transfer, Paper No. 363, July 18-22, 2011, Istanbul, Turkey.
5. N. Yilmaz, "Detailed Multiphysics Modeling and Validation of Thermocouple Readings in Fires," Journal of Fire Sciences, Vol. 29, No. 5, pp. 443-464, 2011.

d) Synergistic Activities

1. *Editorial Board:* Editor-In-Chief of SAE International Journal of Fuels and Lubricants
2. *Leadership:* President of New Mexico Society of Professional Engineers –Albuquerque Chapter, Chair of ASME –New Mexico Section.
3. *Committees:* SAE ABET Relations Committees, International Scientific Committee Member for International Symposium on Naval Architecture and Maritime.
4. *Reviewer:* ASME Papers, SAE Papers, Fuel, Sensors, Energies, Energy & Fuels, Science and Technology of Advanced Materials, Applied Sciences, Heat and Mass Transfer, International Journal of Heat and Mass Transfer, Sustainable Energy Technologies and Assessments, Optics and Lasers in Engineering, Experimental Thermal and Fluid Science, Journal of Hazardous Materials, Environmental Science and Technology, International Journal of Chemical Reaction Engineering, Journal of Aerosol Science, Inverse Problems in Science and Engineering

e) Collaborators & Other Affiliations

(i) *Coauthors & Collaborators (last 48 months, 22 total):* Burl Donaldson, Brian Hogan, Humberto Bocanegra (New Mexico State University); Richard Nelson, Francisco Vigil, Kyle Benalil, Stephen Davis (New Mexico Tech), Greg Tolendino, Jonathan Height, Thomas Hanson, Tomas Sanchez, Walt Gill, Aaron Brundage, Sean Kearney, Vern Nicolette (Sandia National Laboratories); Alpaslan Atmanli, Bedri Yuksel, Ercan Degirmenci, Erol Ileri (Balikesir University); Bora Karayaka (Western Carolina University); David Souders (Flow Science); Hakan Soyhan (Sakarya University)

(ii) *Graduate advisors (2 total):*

Burl Donaldson (New Mexico State University); Richard Deller (Bradley University)

(iii) *Graduate (13 total) advisees:*

Stephen Davis (PhD, current), Francisco Vigil (MS, current), Miquela Vigil (MS, current), Hugh Dias (MS, current), Jasent Quintana (MS, 2014), Juan Vigil (MS, 2014), David Souders (MS, 2014), Antonio Calva (MS, 2014), Robert Branam (MS, 2014), Richard Nelson (MS, 2013), Tomas Sanchez (MS, 2011), Byron Morton (MS, 2010), Akshin Bakhtiyarov (MS, 2009).

f) Honors & Awards

2014	Young Engineer of the Year by National Society of Professional Engineers
2014	The Scientific and Technological Research Council of Turkey Visiting Scientist Fellowship
2013	New Mexico Tech Distinguished Teaching Award
2013	SAE International Faculty Advisor Award
2011	SAE International Ralph R. Teetor Educational Award

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 Department of Mechanical Engineering,
 New Mexico Institute of Mining and Technology, Socorro, NM, USA
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 Department: <http://infohost.nmt.edu/~mecheng/html/peoplepages/azagrai.html>
 Research Laboratory: <http://liss.nmt.edu/>



(a) Professional Preparation

Ph. D. Mechanical Engineering, University of South Carolina, Columbia, SC, April 5th, 2002.
 M. E. Department of Acoustics, Taganrog State University of Radio-Engineering, Taganrog, Russia, April 24th, 1997.
 B. S. School of Law, Taganrog State University of Radio-Engineering, Taganrog, Russia, January 28th, 1997.
 B. E. Department of Acoustics, Taganrog State University of Radio-Engineering, Taganrog, Russia, June 24th, 1996.

(b) Appointments

July 2014-present Chairman of the Department of Mechanical Engineering, New Mexico Institute of Mining and Technology, Socorro, NM
 March 2011-present Associate Professor (tenured), Department of Mechanical Engineering, New Mexico Institute of Mining and Technology, Socorro, NM
 Aug. 2006-March 2011 Assistant Professor, Department of Mechanical Engineering, New Mexico Institute of Mining and Technology, Socorro, NM
 2002-Jul. 2006 Post-Doctoral Fellow and Research Scientist, Department of Civil, Ocean and Environmental Engineering, Stevens Institute of Technology, Hoboken, NJ
 1998-2002 Research and Teaching Assistant, Department of Mechanical Engineering, University of South Carolina, Columbia, SC

(c) Personal Honors, Awards and Scholarships

- September 14th, 2011 - *The Achenbach Medal* for contribution to the advancement of the field of Structural Health Monitoring.
- March, 2008 – Air Force Summer Faculty Fellow (SFFP) for the 2008.
- March, 2002 – 1st Place best student paper award of *SPIE's 7th Symposium on NDE for Health Monitoring and Diagnostics*.
- December 21st, 2001 – 2nd Prize best student paper award in structural acoustics and vibration. Acoustical Society of America, American Institute of Physics.
- April 20th, 1998 - The National Scholarship of the President of Russian Federation for Education Abroad
- January 1st, 1996- December 10th, 1996 – SOROS STUDENT, Graduate student scholarship sponsored by the International Soros Science Education Program.
- September 10th, 1996 – The National Scholarship of the President of Russian Federation.
- 1995 – Taganrog State University of Radio-Engineering College of Electronics and Apparatus Design annual scholarship for excellent study, Taganrog, Russia.
- 1994 – Taganrog State University of Radio-Engineering annual scholarship for excellent study, Taganrog, Russia.
- March 1994 - Special award for 1st place at the Philosophy section of XXXXI Student's Scientific Conference, TSURE, Taganrog, Russia

(d) Honors and Awards Received by Current and Former Students

- *REBECCA CLEMENS*: Fall 2012 – NMIMT's Graduate Student Association travel grant.
- *DANIEL MEISNER*: June 2012 – Diploma for participation in International Youth Competition of Scientific Research Works "Student and Science & Technology Progress," paper "Magneto-elastic Active Sensors for Detection Of Incipient Fatigue Damage in Aerospace Structures," by Meisner, D and Zagrai, A, Taganrog, Russia.
- *BENJAMIN COOPER*: Summer 2012, Competitive (national) "Space Scholars" stipend for summer research opportunities at Space Vehicles Directorate, Kirtland AFB.
- *ANDREW MURRAY*: Summer 2010 – Competitive (national) "Space Scholars" stipend for summer research opportunities at Space Vehicles Directorate, Kirtland AFB.
- *ABRAHAM LIGHT-MARQUEZ*: Summer 2009 – Selected (in a national wide competition) and funded to participate in Los Alamos Dynamics Summer School (LADSS). He was also funded to participate in LANL Engineering Institute activities during Summer 2010.
- *DEREK DOYLE*: October 2008 – Honorable Mention in Best Student Paper Competition at *ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems 2008* for the paper "Damage Detection in Satellite

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Bolted Joints” by Derek Doyle, Andrei Zagrai, Brandon Arritt, and Hakan Çakan.

Spring 2008 – Outstanding employee award from Kirtland AFB.

Summer 2007 – Competitive (national) “Space Scholars” stipend for summer research opportunities at Space Vehicles Directorate, Kirtland AFB.

December 2007 – NMIMT’s Graduate Student Association travel grant.

- *WALTER KRUSE*: Summer 2008 –Selected (in a national wide competition) and funded to participate in Los Alamos Dynamics Summer School.
- *HAKAN ÇAKAN*: October 2007 – Awarded a 3rd place “Best Poster” cash award at the RGAM symposium for our joint research work on magneto-mechanical impedance structural identification.
- December 2007 – NMIMT’s Graduate Student Association travel grant.

(e) **Media**

- University media, NMTSat and suborbital launches.
- Featured in “Metal Speaks” in October 22nd, 2007 issue of the Business Outlook section of the *Albuquerque Journal*.
- Featured in “Researchers work on self-healing structure materials” in September 1st, 2007 issue of *El Defensor Chieftain*.
- Donskoy, D., Zagrai, A.N., Chudnovsky, A., WU, H. (2005) “Nonlinear Acoustic Vibro-Modulation Technique for Materials Damage Diagnostics and Prognostics,” featured in *Advanced Materials & Processes*, Vol. 163, N. 4, pp. 34, April 2005, www.asminternational.org/AMP.

(d) **Research Activity**

Research Highlights

First known active piezoelectric SHM in space environment during sub-orbital space flight (2011). Development of a new NDE/SHM method for assessment of bolted joints integrity in complex structures with large number of bolts (2008). Development of a new magneto-mechanical impedance (MMI) SHM methodology using in-house developed magneto elastic active sensors (MEAS) (2008). Demonstration of real-time nonlinear acoustic fatigue damage monitoring before fracture in SHM format (2005). Development of analytical models for dynamics of uniform circular plates with elastic edge support and for multi-modal vibrations of a mine-like buried object (2005). Development of an analytical model for electro-mechanical impedance method that includes dynamics of structure and the sensor in 2D circular geometry (2001).

Research Directions

Space systems and structures: design and practical realization of condition monitoring solutions for space systems; real-time SHM of satellites, spacecrafts and other space vehicles; spacecraft assembly, pre-launch, launch, in-space, and re-entry diagnosis; structural integrity aspects in commercial space transportation; mechanical engineering of space systems.

Sensors and structural health monitoring (SHM): active and passive technologies for structural monitoring; structural analysis and condition assessment; detection and evaluation of incipient structural/material damage; exploiting the damage-induced material nonlinearity as a diagnostic feature; material characterization; structural identification and damage features extraction algorithms: HHT, correlation analysis, statistical data processing and neural networks applications.

Intelligent systems, structures, and mechanisms: analysis and design of the smart/intelligent/adaptronic structures and mechanisms incorporating active materials, smart controls and embedded intelligence; Mechatronics, networks of sensors and actuators for global and local sensing methodologies, artificial intelligence decision support for sensor networks.

Structural dynamics: vibration of discrete, continuous, and complex structures; modeling of the multi-scale structural nonlinearities; dynamics of complex structural systems interacting with granular medium (soil, sand); linear and nonlinear wave propagation in solids, liquids and gases; contribution of the nano-micro-meso scale phenomena into the structural dynamic response.

Funded Research Projects at NMIMT.

1. Technical point of contact and Principal Investigator for New Mexico Tech activities in FAA Center of Excellence for Commercial Space Transportation, approx. \$300k annually. Also a Principal Investigator on “SHM framework for CST” FAA Office of Commercial Space Transportation, 2016, \$100,000 per year (50% FAA, 50% NMT co-share).

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2. “Magneto-Elastic Sensing for Structural Health Monitoring,” FAA Office of Commercial Space Transportation, 2011-2015, Principal Investigator, \$80,000 per year (50% FAA, 50% NMT co-share).
3. “Prediction of Remaining Useful Life of Rotorcraft Structures with a Fiber-Optic-Based Sensing System and a Unified Damage Mechanism-Based Model,” NAVY STTR, 2014-2015, \$80,000 project total with \$32,000 to NMT. University collaborator (subcontractor).
4. “High Performance Acousto-Optic Arrays based on Fiber Bragg Gratings for Measuring Launch Acoustics,” NASA STTR, 2012-2013, \$125,000 project total with \$35,500 to NMT. University collaborator (subcontractor).
5. “Structural Health Monitoring for Commercial Space Vehicles,” NASA Flight Opportunity Program, 2012-2013, awarded funding for one high altitude balloon and one suborbital flight, Principal Investigator.
6. “NMTSAT: New Mexico Tech Nanosatellite,” NASA EPSCoR, 2012-2013, \$50,000 (50% NASA EPSCoR, 50% NMT co-share). Co-Principal Investigator.
7. “Embedded Ultrasonics for Structural Health Monitoring of Space Applications,” Air Force Research Laboratories Space Vehicles Directorate, Kirtland AFB, 2009-2012, Principal Investigator, \$199,999.
8. “Nonlinear Structural Health Monitoring of the Responsive Space Satellite Systems using Magneto Elastic Active Sensors (MEAS),” AFOSR, 2007 - 2010, Principal Investigator, \$259,897.
9. “Structural Health Monitoring and Self-Healing of Aerospace Structures,” NASA EPSCoR, October 2007 - September 2010. The project is awarded to New Mexico State University – New Mexico Tech research team. Total funding - \$1,502,854. NASA requested funding - \$751,427. Co-Principal Investigator.
10. “Control of the Structural Boundary Conditions using Piezoelectric Elements and Shunt Circuits,” DOE through Sandia National Laboratories, SURP Program, October 2007 - September 2008, Principal Investigator, \$40,000.
11. “Exploring the Acoustic Nonlinearity for Monitoring Complex Aerospace Structures,” AFOSR, June 2007 - November 2007, Principal Investigator, \$45,295.

(e) Teaching/Advising Activity

Undergraduate Courses: Mechatronics and Mechatronics Laboratory, Dynamics and Vibrations in Structural Design, Fundamentals of Dynamic Systems, Mechanics of Solids, Structural Design, Measurements and Instrumentation, Design of Electro-Mechanical Equipment.

Graduate Courses: Nondestructive Evaluation, Sensor Technology, Vibration in an Elastic Continuum.

(f) Professional service

Membership: a member of the American Society of Mechanical Engineers (ASME), A member of ASME Aerospace Division Executive Committee (2015), A member of ASME Nondestructive Evaluation, Diagnosis, and Prognosis Division (NDPD) Executive Committee and treasurer of NDPD, A member of international *Adaptive Structures and Material Systems Technical Committee* of the Aerospace Division of ASME, a senior member of the American Institute of Aeronautics and Astronautics (AIAA), A member of international *Adaptive Structures Technical Committee* of AIAA, The Acoustical Society of America (ASA), The International Institute of Acoustics and Vibration (IIAV).

Conferences/Symposia: Member of an advisory committee of International Conference on Condition Monitoring (ICCM 2011), General chair (2014) and technical co-chair (2012, 2013) of *ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, organized and chaired a Symposium on SHM/NDE at SMASIS-2010, *ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, organized/ chaired/co-chaired 11 sessions at major international/national conferences, served as a judge for *Student Best Paper Competitions* at SMASIS-2010, SMASIS-2009, SPIE-NDE/SHM-2009 conferences, organized and chaired student hardware competition at SMASIS-2010, served as a member of the organizing committee of Student and Young Professional Development Symposium at SMASIS-2010.

Journals: Invited Associate Editor, Journal of Intelligent Material Systems and Structures. Served as a reviewer to 20 international journals including Journal of the Acoustical Society of America (JASA), Journal of Intelligent Material Systems and Structures (JIMSS), Mechatronics, Smart Materials and Structures (SMS), Structural Health Monitoring: An International Journal, and others.

Funding Agencies: Reviewed proposals for NSERC, AFOSR and NSF.

University:

Committees: Chair of Academic standard and Admission Committee, member of university disciplinary, member of university benefits committee, member of university strategic planning “Growth” committee, member of various faculty search committees, member of several tenure committees.

(g) Publications

Patents:

1. Zagrai, A.N. and Doyle, D., (2010) “A Method for Assessment of Bolted Joint Integrity Using Nonlinear Guided Waves,” Patent 8,671,761. Issued March 18, 2014.
2. Giurgiutiu, V., Bao J., Zagrai, A.N., (2006) “Structural Health Monitoring System Utilizing Guided Lamb Waves Embedded Ultrasonic Structural Radar,” Patent 6,996,480. Issued October 13, 2005.

Book Chapter:

Zagrai, A.N. and Giurgiutiu, V., (2009) “Electro-Mechanical Impedance Modeling,” Chapter 5 in *Encyclopedia of Structural Health Monitoring*. Editors: Christian Boller, Fu-Kuo Chang and Yozo Fujino, *John Wiley & Sons, Ltd.*

Refereed Journal Papers:

1. Zagrai, A. and Çakan, H., (2010) “Magneto-mechanical Impedance Identification and Diagnosis of Metallic Structures,” *International Journal of Engineering Science*, Vol. 48, Issue 10, October 2010, pp. 888-908.
2. Sevostianov, I., Zagrai, A., Kruse, W.A. and Hardee, H.C. (2010) “Connection Between Strength Reduction, Electric Resistance and Electro-Mechanical Impedance in Materials with Fatigue Damage,” *International Journal of Fracture*, Vol. 164, N. 1 / July, 2010.
3. Zagrai, A., Doyle, D., Gigineishvili, V., Brown, J., Gardenier, H., Arritt, B., (2010) “Piezoelectric Wafer Active Sensor Structural Health Monitoring of Space Structures,” *Journal of Intelligent Material Systems and Structures*, Vol. 21, N. 9, pp. 921-940, first published on May 4, 2010.
4. Doyle, D., Zagrai, A., Arritt, B., Çakan, H., (2010) “Damage Detection in Bolted Space Structures,” *Journal of Intelligent Material Systems and Structures*, Vol. 21, N. 3, pp. 251-264, first published on November 25, 2009.
5. Zagrai, A (2009) “Magneto-Mechanical Impedance of Metallic Structures,” published online 22 December 2008 in *JASA Express Letters* section of the *Journal of the Acoustical Society of America (JASA)*, Vol. 125, N. 1, January 2009, pp. EL1-EL7.
6. Zagrai, A., (2009) “Emerging Technologies for Structural Damage Detection and Evaluation,” *i-manager’s Journal on Future Engineering and Technology*, Vol. 4, N. 2, November 2008 – January 2009, pp. 1-16.
7. Zagrai, A., Donskoy, D., Chudnovsky, A., and Golovin, E., (2008) “Micro and Macro Scale Damage Detection using the Nonlinear Acoustic Vibro-Modulation Technique,” *Research in Nondestructive Evaluation (RNDE)*, a Journal of the American Society for Nondestructive Testing, Vol. 19, N. 2, pp. 104-128.
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76. Zagrai A.N. (1997) "Peculiarities in the Field Formation of an Acoustic Parametric Array", *Proceedings of the National Scientific Conference of Students and Young Scientists "Radioelectronics, Microelectronics and Control Systems"*, pp. 243-244, Taganrog, Russia, 1997. (In Russian)
77. Georgi, M.U., Zagrai, A.N., (1996) "Dynamics of Radiation Field Formation of an Acoustic Parametric Array in the Discrete Horizontal Layered Structure", *Proceedings of the III National Scientific Conference "Technical Cybernetics, Radioelectronics and Control Systems"*, pp. 243-244, Taganrog, Russia, 1996. (In Russian)
78. Doroshenko V.U., Zagrai A.N. (1996) "Modeling of the Piezoelectric Transducer with Circular Electrodes", *Transactions of Taganrog State University of Radio-Engineering Young Scientists*, Taganrog, Russia, 1996. (In Russian)
79. Zagrai N.P., Zagrai A.N., (1995) "Nonlinear Effects in Acoustic Resonator Exited by the Short Impulses", *Proceedings of the II National Scientific Conference*, pp. 64, Taganrog, Russia, 1995. (In Russian)

Appendix V. Design Clinic Sponsors from New Mexico

Sponsor	Location	Number of Projects
Honeywell	Albuquerque	1
Holloman Air Force Base	Alamogordo	2
Sandia National Labs	Albuquerque	2
White Sands Research and Developers LLC	Las Cruces	1
Solaro Inc.	Socorro	1
Los Alamos National Labs	Los Alamos	2

Appendix VII. Hispanic Serving Institute Certificate



U.S. Department of Education
Office of Postsecondary Education

April 10, 2012

OPEID: 00265400

New Mexico Institute of Mining & Technology
Socorro, NM

Dear Daniel H. Lopez:

We are pleased to inform you that your recent request for Designation As An Eligible Institution under Title III and Title V programs of the Higher Education Act of 1965, as amended by the Higher Education Opportunity Act of 2008 (HEA) is approved. Subject to the specific program requirements, your institution **may apply for a new grant** under any of the Title III programs and the Title V, Hispanic-Serving Institutions Programs.

As a result of receiving this designation, your institution **is also eligible for a waiver of the non-Federal share matching requirements** under the Federal Work Study Program, the Federal Supplemental Educational Opportunity Grant Program, and the TRIO Student Support Services Program under Title IV of the HEA, as well as the Undergraduate International Studies and Foreign Language Program authorized by Title VI of the HEA. The eligibility for a waiver of the non-Federal share matching requirements applies for a **five-year** period beginning **July 1, 2012**. The offices within the Department that administer those specific programs will handle the waiver of the cost sharing. Accordingly, you do not need to reapply for designation as an eligible institution for five years, unless you wish to apply for a grant under the Title III programs or the Title V, Hispanic-Serving Institutions Programs. You must apply for eligibility designation in each year you wish to participate in a program competition for funding

Please retain this letter as evidence of your eligibility and for an adequate audit trail.

If you have questions concerning this designation, please contact Kelley Harris at kelley.harris@ed.gov or 202 219-7083 or Carnisia Proctor at carnisia.proctor@ed.gov or 202 502-7606.

Sincerely,

A handwritten signature in black ink that reads "Leonard L. Haynes" followed by a stylized flourish.

Leonard L. Haynes, Ph.D
Senior Director
Institutional Service

Appendix VIII. Department of Mechanical Engineering Advisory Board

Mr. Derek Doyle
Energy Responsive Structures Lead/Team
Technical Advisor Integrated Structural Systems
AFRL Space Vehicels Directorate
505-846-5333
derek.doyle@us.af.mil

Ms. Rosalie Kitts
Mechanical Engineer
Hello Inc.
415-722-3455
rosalie@sayhello.com

Mr. Leroy Garley
Senior Aeronautical Engineer/Sr Member of
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Dr. Timothy J. O'Hern
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Mr. Matt Rush
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505-845-7968
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Mr. Jordan Warton
TM2500 Mechancial Technical Leader
GE Power and Water
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Mr. Tony Schauer
Chief Scientist
Holloman Airforce Base
575-679-2659
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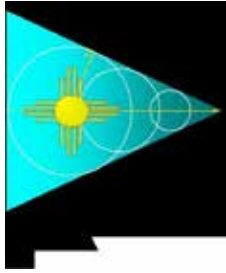
Mr. Jon Berg
R&D S&E, Mechanical Engineer
Sandia National Laboratories
505-284-0905
jcberg@sandia.gov

Dr. Paul Jaramillo
Technical Director
White Sands Research & Development,LLC
575-382-0069
drj@wsrds.com

Mr. Mark Leifeste
Director, Laboratories Department
Jacobs Technology/NASA White Sands
575-524-5682
mark.r.leifeste@nasa.gov

Mr. Reinhold Wirth
Lead Project Engineer
Honeywell Aerospace
505-828-6207
Reinhold.Wirth@Honeywell.com

Appendix IX. Letters of Support



Dr. Paul T. Jaramillo, Member Manager
White Sands Research and Developers, LLC
12595 Baylor Peak Road
Las Cruces, NM 88011
Phone/Fax: (575) 382-0069
Email: DrJ@WSRDs.com

November 19, 2015

Dr. Andrei Zagrai, Associate Professor and Chair
Department of Mechanical Engineering
New Mexico Institute of Mining and Technology
801 Leroy Place
Socorro, NM 87801

Dear Dr. Zagrai,

I am writing this letter to state my full support for the Doctor of Philosophy Degree in Mechanical Engineering with Dissertation in Intelligent Energetic Systems at New Mexico Tech (NMT). As I sat down to write this letter, I wondered what I could say that would not already be said by members of the National Labs, Test Centers and other prestigious affiliates of NMT. Fortuitously, I then received an overseas phone call from an associate in a young and vibrant US commercial launch enterprise with operations overseas. You might be surprised to hear that the majority of our conversation centered on NMT's degree programs in Explosives Engineering and NMT's contemporaneous efforts to create a PhD program in Intelligent Energetic Systems. I certainly was surprised as this was supposed to be my business opportunity, after all.

Indeed, rockets are literally dynamic "systems of energetic systems," by virtue of their speed (kinetic energy), altitude (potential energy), fuel (chemical energy) and payloads (potentially other types of energy). The reason this topic struck a chord with our prospective client is that he has been dealing firsthand with the enormous obstacles facing commercial launch companies. Many of the obstacles revolve around the ability to quantify risk to the "uninvolved public," a term used by the Federal Aviation Administration (FAA) to describe the population at large. We discussed the problems related to the dearth of models that describe rocket-applicable energetic events that can generate considerable debris, and therefore, create hazards to both mission personnel and the uninvolved public. While sophisticated hydrocodes exist that may be able to model such events, they typically take a supercomputer to run, and therefore, are impractical given the sheer number of mission scenarios that must be evaluated and each scenario having a unique energy-state time-history as the rocket proceeds on mission.

As important as is that aspect, we must cast much wider nets beyond studying models independently if we are to open space to commercial entities and even "involve" the public as spectators and passengers. We must integrate knowledge and models across interdependent systems and areas of inquiry, that is, we must be interdisciplinary in our approach. From the perspective of the commercial space industry, considering these broader questions is the only path to a future where access to space and later space travel can become more commonplace.

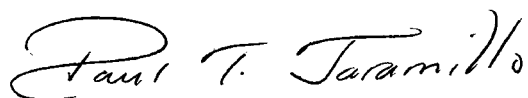
Therefore, I was very pleased when I read of the approach to this proposed Ph.D. program. It is not just another academic program, but cleverly draws from NMT's unique strengths: strengths that have been honed over many years, and in some cases, over many decades. It also draws from the strengths of its affiliations with the National Labs, which are at the forefront of several key technologies. I read with particular interest when the program description used terms such as "intelligent," "adaptable," "real-time analytics," "smart systems," "health monitoring," "intelligent structures," "systems engineering," and "cross-disciplinary analysis." It reminded me of a white paper I had written years ago entitled "Safety of Flight as an Integrated Approach (SOFIA)," which described a system to reduce the risk of overland rocket flight.

It is an inescapable mathematical fact that the instantaneous impact point (IIP), i.e., the place a vehicle would impact if it lost thrust or control during flight, circumnavigates the earth before a vehicle reaches orbit. Thus, there is no launch point on earth that will not result in some risk to the public. We simply have to deal with risk and so SOFIA was conceived as an onboard "intelligent system" that "monitored its host vehicle's health" and energy state in relation to its environment. In other words, SOFIA is a "smart system:" aware of its mission, but also continually aware of the risk its flight poses to the public. Using this information, SOFIA could "adapt" its mission profile to lower the risk in "real-time." In writing the paper, I had the benefit of close associations with persons experienced in the launch business. Collectively, they had literally thousands of launches under their belts. Now, with the advent of Automatic Dependent Surveillance – Broadcast (ADS-B), which is replacing the network of surveillance radars, upon which the FAA relies for air traffic control, real-time situational awareness of air traffic could augment awareness of population allowing intelligent energetic systems to further minimize risk to the public.

While the white paper was written before Spaceport America and other inland spaceports became a reality, it is no surprise that still today nearly all orbital flights originate from coastal launch sites. This fact hampers not only young commercial space enterprises with obstacles and costs, but also reduces the practicality of space travel to a host of industries that would utilize spaceflight services for a multitude of applications and purposes. It also prevents inland states like New Mexico from fully engaging in commercial space, particularly in orbital flight.

Clearly, we are on the cusp of a new industry, which will elevate and make commonplace a host of current technologies. However, it will also herald in entirely new areas of study. A PhD program in Intelligent Energetic Systems at NMT could play an important, if not pivotal role in our burgeoning industry. Therefore, I wish to convey my enthusiastic and unconditional support for your efforts to bring this program to fruition. The phone call I had yesterday would suggest that you would find similar sentiments across the commercial space sector.

Sincerely,

A handwritten signature in cursive script that reads "Paul T. Jaramillo". The signature is written in black ink and is positioned above a horizontal line.

P. T. Jaramillo, Ph.D.



DEPARTMENT OF THE AIR FORCE

AIR FORCE RESEARCH LABORATORY (AFRL)
EGLIN AIR FORCE BASE, FLORIDA

November 18, 2015

MEMORANDUM FOR

Dr. Jamie Kimberley
Assistant Professor
Department of Mechanical Engineering
New Mexico Institute of Mining and Technology
801 Leroy Place
Socorro, NM 87801

FROM: Air Force Research Laboratory, Munitions Directorate

SUBJECT: NMIMT Letter of Support

Professor Kimberley,

I am writing to express my support for the proposed Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems at New Mexico Institute of Mining and Technology. This program will be uniquely positioned to address the needs of the Department of Defense and specifically the Munitions Directorate of Air Force Research Laboratory (AFRL) in several ways. With a vast research portfolio in the areas of fuzing technologies, weapon systems integration, modeling & simulation, damage mechanisms, and explosive fill formulation; the contributions made to the ongoing efforts would be significant. First, graduates of this program represent potential hires needed to support AFRL missions. These graduates will develop a strong background in mission critical areas of explosives engineering and systems engineering, allowing them to more readily transition into their employment at AFRL due to their specialized training. Second, this program may provide a pathway for collaborative research between AFRL and NMIMT, addressing issues important to national security, and providing mutual benefit to both institutions. Lastly, current AFRL employees may seek to leverage the resources provided by this program to obtain an advanced degree relevant to their current employment. Overall, I view the establishment of this program as positive step forward in addressing the future needs for the highly skilled workforce of scientists and engineers required to ensure our national security.

I am excited by the prospect of this program and wish you the best of luck with the approval process. Please do not hesitate to contact me if I can be of further assistance.

Respectfully,

A handwritten signature in black ink, appearing to read "Justin C. Lee".

Justin C. Lee

Aerodynamics Munitions Sciences

NTEC-15-115
November 19, 2015

New Mexico Institute of Mining and Technology
c/o Dr. Andrei Zagrai, Chairman
Department of Mechanical Engineering
801 Leroy Pl.
Socorro, NM 87801-4796

Dr. Zagrai:

Jacobs Technology is the prime contractor for the NASA TEST Contract at the NASA JSC/White Sands Test Facility (WSTF) at Las Cruces, NM. Jacobs' role in this position is providing the technical expertise and qualified manpower to safely and effectively test rocket propulsion systems, conduct materials testing and complete highly energetic test programs involving fire and explosion to enable the safe exploration of space. We require a continuous stream of new, technically capable engineers, scientists and technicians and actively recruit from NMIMT. Jacobs also maintains an active internship program with NMIMT to provide hands-on experience to students studying in relevant fields, notably mechanical engineering. A primary reason for establishing this recruiting and internship relationship is the unique education that NMIMT students receive; one that meshes perfectly with our technical requirements and support of NASA.

The planned elements of the proposed NMIMT PhD program in *Mechanical Engineering with Dissertation in Intelligent Energetic Systems* form an excellent fit for the work performed by Jacobs, particularly at the NASA/White Sands Test Facility, but also at other Jacobs contact venues. Our work ranges from design of experiments and tests involving propellants, pyrotechnic devices, pressurized systems and reactive materials, through conduct of hazardous testing, to the analysis of critical test results. In addition, the ability to design/build test systems capable of operating safely in such tests and providing high-speed, high fidelity test data is crucial. These skills are not commonly taught in universities, especially in the depth proposed. The proposed curriculum brings together a very unique combination of technical understanding which is typically only gained through years of experience following a basic education. The knowledge gained through such an educational program gives any graduate a clear head start in the field and will make them a highly recruited capability for any employer in the field of energetic materials testing and/or analysis. All the elements of the curriculum proposed, including but not limited to application of advanced math/science/engineering, understanding complex engineering problems, design/conduct of experiments and data analysis as well as the ability to conduct these activities safely we consider to be cornerstones of a well-constructed educational program in this field.

For these reasons, Jacobs Technology Inc is pleased to offer its endorsement of the proposed PhD program, *Mechanical Engineering with Dissertation in Intelligent Energetic Systems*

at New Mexico Institute of Mining and Technology. Approval of this degree program creates a much-needed source for highly skilled engineers needed by our company. We typically hire several mechanical engineers each year and when we find engineers who have experience in this field, it is typically not extensive and must be further developed in-house after hiring. We eagerly await approval of this degree program and our opportunity to hire its graduates.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mike Anderson".

Mike Anderson
Jacobs Technology Inc.
NTEC General Manager
NASA White Sands Test Facility



Yongchao Yang, Ph.D.

Director's Funded Postdoctoral Fellow
Engineering Institute
National Security Education Center
Los Alamos National Laboratory
P.O. Box 1663, MS T001
Los Alamos, New Mexico 87545

Phone: 832-335-3003
Fax: 505-663-5225
Email: yyang@lanl.gov

November 18, 2015

Dear State of New Mexico Committee:

It is my great pleasure to strongly support the proposal of the Department of Mechanical Engineering at New Mexico Tech for a new Ph.D. program with Dissertation in Intelligent Energetic Systems. My background and experience in this research field has convinced me that the department's proposed Ph.D. program truly has tremendous potential to become one of the next-generation statewide and national educational and research excellence centers in the field of intelligent systems.

The department's well-forward vision and unique collaboration relationship with national laboratories has placed herself in an extremely advantageous position in establishing such a Ph.D. program. I have been working on the areas of intelligent civil and mechanical systems since my Ph.D. study at Rice University, which continues to be my current research focus in the National Security Education Center at Los Alamos National Laboratory. In recent years I have witnessed that on the order of trillions from governmental and industrial agencies, as well as massive research funding from National Science Foundation and Department of Energy, have been and continue to be invested in the national public and security infrastructure and renewable energy structures, where intelligent energetic systems play a critical role. Contrast to the rapidly growing need of research and applications in intelligent energetic systems is the lack of an integrated and focused high-level educational and research program state and nation wide, which has been presciently identified by the department. The department's proposed Ph.D. program would have game-changing educational and research impacts in this notably emerging field: the leadership in this field would be established with strong and focused competence for large influential projects, and the trained Ph.D. graduates with the cutting-edge professional would bring significant contributions in academia and industries. Furthermore, with the intelligent energetic systems aligned with the national security mission of the Sandia and Los Alamos National Laboratories in the neighborhood, tremendous amount of collaboration opportunities presents to support the educational and research aim and development of the department's proposed program.

The top-level faculty members in the Mechanical Engineering Department at NMT provide strong support for the excellence of the proposed Ph.D. program. Especially, I have known for two years Dr. Donghyeon Ryu, who has been conducting exceptional research and becoming a rising star in the field of smart materials and intelligent structures. Focusing on the topical and cutting-edge nanotechnology, his work

has opened up vistas for the coming generation of its application in intelligent structures. I believe it is these outstanding faculty members that sustain the department's high-level standard of excellence, and I have no doubt that with the establishment of the proposed Ph.D. program, the department will continuously attract many more excellent faculty and researchers for establishing her leadership in the field of intelligent systems.

In closing, with outstanding research vision, exceptional faculty members, and a unique position with national laboratories, the Mechanical Engineering Department at NMT has what it takes to establish a strong Ph.D. program for state and nation wide educational and research excellence in intelligent energetic systems. The department's proposal has my strongest support and I eagerly look forward to many close collaborations between us in the near future.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Yongchao Yang', written in a cursive style.

Yongchao Yang, Ph.D.



The Engineering Institute

Mail Stop T-001

Los Alamos, New Mexico 87545

505-663-5227/Fax 505-663-5225

dmascarenas@lanl.gov

Date: November 18, 2015

Dear New Mexico State Officials;

My name is David Mascarenas. I am currently a technical staff member and deputy-director of the Engineering Institute at the Los Alamos National Laboratory. In this role I am responsible for the day-to-day operations of our educational and recruiting programs. I also perform research in the areas of structural health monitoring, wireless sensor networks, robotics, tamper-evident seals, and signal processing. I am an author on 18 peer-reviewed journal papers, and more than 40 conference proceedings. My work has been cited 681 times with an H-index of 14 according to google scholar as of Oct 2015.

I recently became aware of the proposed Doctor of Philosophy in mechanical engineering with a dissertation emphasis in Intelligent Energetic Systems at the New Mexico Institute of Mining and Technology (NMT). Upon reading the executive summary of this program I became quite excited. Partially because if such a program had existed when I was a graduate student I would have probably seriously considered enrolling. The curriculum itself consists not only of fundamental courses in engineering mechanics but also the exciting fields of energetic materials and intelligent systems. I believe this combination of courses will be very attractive to many students in the state of New Mexico. I can think of at least one student that I work with who is currently an undergraduate who would probably jump at an opportunity to join this program. The second reason I was excited was because I think this combination of courses will be greatly helpful for the next generation of engineers to address emerging global security challenges. One of the educational programs I run at Los Alamos National Laboratory is called the Advanced Studies Institute. In the course of this program we invite PhD students and postdocs from around the country in all technical disciplines to come to Los Alamos National Laboratory. The students are arranged into multidisciplinary groups and are tasked with proposing solutions to Global Security challenges for which no good solution currently exists. We have had participants in this program who have had backgrounds in shock physics as well as energetic materials. I noticed that these students tended not to have as much background in intelligent systems technology. I felt that if they had more of a background in this area they would have had a much easier time developing the multi-disciplinary solutions to problems that our facing our nation today. One example of such a problem would be developing sensors and detectors capable of inticating the presence of energetic materials. Detection of energetic materials is an increasingly important global security challenge. Students who have backgrounds both in the chemistry of energetic materials as well as signal processing, and mechatronics, and the material science of sensing will be more well-prepared to address these challenges than the majority of the students being

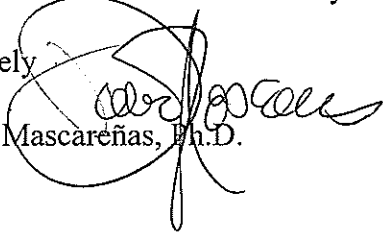
produced by current engineering training practices.

I would like to give my support for the development of this new program at NMT that combines the disciplines of intelligent systems with explosive engineering. I could see myself trying to attract students with this training into our Dynamic Summer School as well as our Advanced Studies Institute.

Please feel free to contact me if you have any questions.

Sincerely

David Mascareñas, Ph.D.

A handwritten signature in black ink, appearing to read 'David Mascareñas', written over a circular scribble.

November 18, 2015



The Engineering Institute

Mail Stop T001

Los Alamos, New Mexico 87545

505-980-9123/Fax 505-663-5225

amarchi@lanl.gov

Date: November 19, 2015

Refer To: NSEC:01-NMT-DR1

Dear State of New Mexico Committee,

By way of introduction, I am a New Mexico Institute of Mining and Technology (NMT) alumnus and a postdoctoral fellow at Los Alamos National Laboratory's (LANL) Engineering Institute under the National Security Education Center. I am writing to express my utmost support for the development of a new PhD program in Mechanical Engineering with dissertation in Intelligent Energetic Systems (MENG-IES). I am a firm believer in directing education based on current real-world needs – I experienced it firsthand. During my time at NMT, I was fortunate enough to be the first participant in a cooperative program between NMT's Chemical Engineering department and LANL's Engineering Division. This opportunity provided insight to real-world problems that could not be conceived in general academic curriculum. Because of my direct involvement with specific national security needs, I was inspired to return to New Mexico and LANL to continue working in this field following completion of my PhD from Duke University. Creating a doctoral program that directly addresses the needs of local national laboratories will further drive in-state-educated students to remain in the state, finding careers at local companies or national laboratories. Furthermore, New Mexico Tech is primed for a program in intelligent energetic systems because of its close connection and proximity to the Energetic Materials Research and Testing Center, LANL, and Sandia National Laboratories. The focused curriculum will produce students with proficiencies that are immediately required for programmatic work at these establishments. Additionally, their research topics can be tuned to precisely address industrial and national security needs.

One goal of the MENG-IES program, as I see it, is to educate students in disciplines that are immediately beneficial for in-state institutions. Through my professional interactions at LANL, I have seen firsthand that there is a need for and lack of engineers with advanced education in intelligent energetic systems. Ultimately, training and educating local students to remain employed in New Mexico will boost our economy by establishing and maintaining in-state capabilities.

Please do not hesitate to contact me if you have any questions regarding my support of this program.

Sincerely,

A handwritten signature in cursive script that reads "Alexandria Nicole Marchi".

Alexandria Nicole Marchi, PhD

Seaborg Institute Postdoctoral Fellow

National Security Education Center – Engineering Institute

Los Alamos National Laboratory



Sandia National Laboratories

Operated for the U.S. Department of Energy's
National Nuclear Security Administration
by **Sandia Corporation**

P.O. Box 5800, MS-0351
Albuquerque, NM 87185-0351

P.O. Box 969
Livermore, CA 94551-0969

Phone: (505) 844-3795
Fax: (505) 844-4394
Internet: bkcook@sandia.gov

Benjamin K. Cook, Sc.D.
Senior Manager, Chief Technology Office

December 24, 2015

Dr. Lorie Liebrock
Dean of Graduate Studies
New Mexico Institute of Mining and Technology

Dear Dr. Liebrock:

Thank you for providing me with an overview of New Mexico Tech's proposed Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems. I have shared the program proposal with Sandia Vice President Jim Chavez, who currently also serves as Sandia's executive liaison to New Mexico Tech. We have both reviewed the proposal and would like to extend Sandia's support for the new Ph.D. program.

The Ph.D. program in Mechanical Engineering with Dissertation in Intelligent Energetic Systems (MENG-IES) addresses a growing private sector and government need for engineers with advanced graduate training in energetics and intelligent systems. Within New Mexico, this program would supply highly qualified graduates with specialized knowledge and design expertise needed by the defense, mining, oil and gas, and other local industries.

New Mexico Tech is an important academic partner for Sandia, serving as a vital source of technical talent and productive research collaborations that help us fulfill our national security mission. Tech's new Ph.D. program in MENG-IES will provide enabling collaborative opportunities and hard-to-find student expertise in energetic smart systems. We look forward to working closely with you and your faculty to help establish this exciting new Ph.D. program. Please let me know if I can provide any further assistance.

Sincerely,

Benjamin Cook, Sc.D.



Exceptional Service in the National Interest

