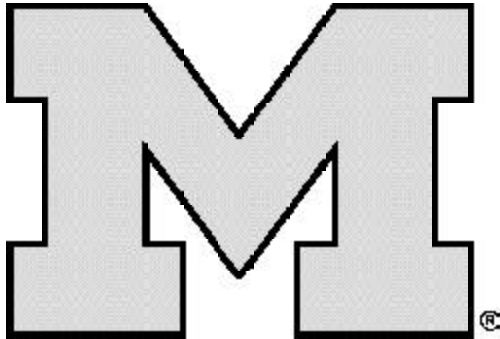


**3rd ANNUAL
MECHANICAL ENGINEERING**



**GRADUATE STUDENT
SYMPOSIUM**

October 5, 2002

University of Michigan
Department of Mechanical Engineering
Ann Arbor, MI

3rd Annual Mechanical Engineering
Graduate Student Symposium

October 5, 2002

Organized by:

**Mechanical Engineering
Graduate Council**

<http://me.engin.umich.edu/Gradcncl/>

Sponsored by:

**Department of
Mechanical Engineering**

<http://me.engin.umich.edu/>

**Rackham School of
Graduate Studies**

<http://www.rackham.umich.edu/>

**Lawrence Livermore
National Laboratory**

<http://www.llnl.gov/>

Graduate Council Members and Support:

Alan McGaughey	Melissa Chernovsky
Harsha Badarinarayan	Amit Dhingra
Matt Cavalli	Tiffany Miller
Haiham Mahmoud	Luciana W. da Silva
Nikhil Mudaliar	Kangwon Wayne Lee
Ramanan Sankaran	Laura Elgas

Advisor:

Professor Jun Ni

Dear Attendees,

Welcome to the Third Annual Mechanical Engineering Graduate Student Symposium at the University of Michigan. The work presented at this event showcases the excellence, originality, and diversity of the research going on in the department by graduate students at all levels. The goals of the symposium are:

- To give current graduate students an opportunity to present their research in a constructive and diverse atmosphere.
- To give new and prospective graduate students an introduction to the research going on in the department.
- To bring together all members of the Mechanical Engineering community in an exciting and thought provoking day.

The nature of the research in the department is constantly evolving, and to meet this growth, a new session on Bio-Engineering has been added this year. The panel discussion will focus on how graduate students can best prepare themselves for finding a job upon completion of their degrees. It is hoped that this portion of the event will be helpful to students at all levels on a variety of career paths.

Feedback to those giving talks and presenting posters is welcome and encouraged! Do not hesitate to ask a question or make a comment to the students who are presenting their research. The sharing of information is an important part of maintaining a strong graduate student community.

Thank you for participating in this year's event. Enjoy.

Alan McGaughey

Schedule of Events

9:00am - 9:30am	Registration – EECS Atrium
9:30am - 11:50am	1st Session of Presentations Bio-Engineering - EECS 1005 Design and Manufacturing - EECS 1200 Dynamics, Systems and Controls – EECS 1301 Fluid Mechanics, Heat Transfer and Combustion – EECS 1001 Solids Mechanics and Materials – EECS 1003
12:00pm - 1:00pm	Lunch and Poster Session EECS Atrium
1:00pm - 3:20pm	2nd Session of Presentations Bio-Engineering - EECS 1005 Design and Manufacturing – EECS 1200 Dynamics, Systems and Controls – EECS 1301 Fluid Mechanics, Heat Transfer and Combustion – EECS 1001 Solids Mechanics and Materials – EECS 1003
3:30pm - 4:30pm	Panel Discussion – EECS 1500 <i>Obtaining a Job with a Graduate Degree</i>
4:30pm - 5:00pm	Awards Presentation and Closing Remarks – EECS 1500

Presentations

Bio-Engineering

Chair: Nikhil Mudaliar

Session I - EECS 1005

Alaa A. Ahmed **9:30 am**
Defining Loss of Balance using Adaptive Failure Detection

Niranjan Deo **9:50 am**
3-D FEM Modeling for Global Cochlear Dynamics

Bing-Shiang Yang **10:10 am**
On Not Tipping a Stepladder

Jaebum Son **10:30 am**
How Human Can Stand on One-Leg

Session II - EECS 1005

Jia-Hsuan Lo **1:40 pm**
Hand Impact Force Reduction in Forward Falls: A Prospective, Controlled, 3-Month Intervention Trial in Young Males

Kathleen DeSantis Klinich **2:00 pm**
Estimating Infant Head Injury Criteria and Impact Response using Finite Element Modeling and Crash Reconstruction

Peggy Meinhart **2:20 pm**
Why are the Elderly at Increased Risk for Falling While Turning?

Sarah Calve **2:40 pm**
Influence of Mechanics on Muscle and Tendon Development

B. E. Layton **3:00 pm**
Experiments on Diabetic Sprague-Dawley Rat Nerve and Nerve Collagens

Design and Manufacturing

Chair: Harsha Badarinarayan

Session I - EECS 1200

Charles Kim **9:30 am**
Design of a Novel Compliant Transmission for Secondary Microactuators in Disk Drives

Byungwoo Lee **9:50 am**
Decomposition-based Assembly Synthesis for In-Process Dimensional Adjustability

Qiang Huang **10:10 am**
Simultaneous Tolerance Synthesis through Process Modeling

Brian Patrick Trease **10:30 am**
Design of Large-Displacement Compliant Joints

Guo Xu **10:50 am**
Simulation of Gas Metal Arc Welding Short Circuiting Transfer using a Front Tracking Method

Session II - EECS 1200

Harsha Badarinarayan **1:40 pm**
Dynamic Air Brake System Modeling for Medium Size Trucks

Theodor Freiheit **2:00 pm**
Productivity of Serial Transfer Lines with Reserve Capacity and Buffers

Karim Hamza **2:20 pm**
Design Optimization for Crashworthiness of Vehicles using Equivalent Mechanism Approximations

Kerr-Jia Lu **2:40 pm**
Compliant Mechanism Synthesis for Shape Change Applications

Valerie Maier-Sperdelozzi **3:00 pm**
Manufacturing System Convertibility Analysis

Dynamics, Systems and Controls

Chair: Haitham Mahmoud

Session I - EECS 1301

- Mahmoud I. Hussein** 9:30 am
Design of Periodic Structures for Desired Dispersive Behavior
- S. L. Pollice** 9:50 am
A Methodology for Generating the Part Handling Logic Control of a Flexible Manufacturing System
- Ashish Deshpande** 10:10 am
Enhanced Mobility via Cooperation
- Don Lochner** 10:30 am
Modeling, Identification and Air Flow Control of a Low Pressure Fuel Cell Stack with a DC Blower
- Farshid Maghami Asl** 10:50 am
Optimal Capacity Management in Stochastic Market Demands
- Jinzhong Wang** 11:10 am
Development of Advanced Methodologies for Internet-Distributed Simulation
- Paul G. Otanez** 11:30 am
Ethernet as a Control Network: Guidelines and Implications

Session II - EECS 1301

- Haitham A. Mahmoud** 1:00 pm
Target Reduction and Balancing using System Norms
- Ali Yigit Ungoren** 1:20 pm
A Flexible Lateral Preview/Predictive Human Driver Model
- Girish Mudgal** 1:40 pm
Terrain Characterization for Durability Predictions
- Hosam K. Fathy** 2:00 pm
Nested Plant/Controller Optimization with Application to Combined Passive/Active Automotive Suspensions
- Ardalan Vahidi** 2:20 pm
System Identification Techniques for Longitudinal Control of Heavy-Duty Vehicles
- Szabolcs Sovenyi** 2:40 pm
Analysis and Cancellation of Vibration Feedthrough in Joystick Controlled Vehicles
- Olivier Poudou** 3:00 pm
Modeling of Bladed Disks Assemblies in Presence of Periodic Frictional Contact

Fluid Mechanics, Heat Transfer and Combustion

Chair: Ramanan Sankaran

Session I - EECS 1001

- Ramanan Sankaran** 9:30 am
A Computational Study of the effects of EGR on the HCCI Engine Performance
- Xin He** 9:50 am
The Study of Ignition Delay Times in HCCI Combustion Systems
- Christos Chryssakis** 10:10 am
An Enhanced Liquid Sheet DISI Spray Model Accounting for Swirl Effects
- Charles Funk** 10:30 am
Turbulence Properties of High and Low Swirl In-Cylinder Flows
- Aristotelis Babajimopoulos** 10:50 am
Modeling the Effects of Gas Exchange Processes on HCCI Combustion
- Tershia Pinder** 11:10 am
Experimental and Computational Investigation of Dynamic Control Strategies for an Ethylene Diffusion Flame
- Luciana W. da Silva** 11:30 am
Micro Thermoelectric Cooler

Session II - EECS 1001

- J. J. Kirchner** 1:20 pm
Dispersion of Solute in Spatially-Periodic Chromatography Media
- Guo Xu** 1:40 pm
One Dimensional Analysis of Gas Metal Arc Welding (GMAW) Metal Transfer
- Rui Zhang** 2:00 pm
Laser-Induced Fluorescence (LIF) Tracers and their Characterization
- Alan McGaughey** 2:20 pm
Distinct Components of Lattice Thermal Conductivity
- Mong-Tung Lin** 2:40 pm
Mixture Evaporative Characteristics Prediction using PSRK Equation of State for a LIF Liquid Fuel Film Measurement
- Melissa Chernovsky** 3:00 pm
Unsteady Spherical Diffusion Flames in Microgravity

Solid Mechanics and Materials

Chair: **Matt Cavalli**

Session I - EECS 1003

Hashem Mourad **9:30 am**
Modeling of Void Formation in Polycrystalline Solids

Dung-An Wang **9:50 am**
Modified Anisotropic Gurson Yield Criterion for Porous Ductile Sheet Materials with Planar Anisotropy

Sung-Tae Hong **10:10 am**
Macroscopic Crush Behavior of Honeycomb Materials: Static Test

Matthew Cavalli **10:30 am**
Modeling the Deformation and Fracture of Weldbonded Joints

Kyoo-Sil Choi **10:50 am**
Fatigue Life Prediction of Fillet Rolling Tool of Crankshaft

Session II - EECS 1003

Shawn Lin **1:40 pm**
Fatigue Life Predictions for Spot Welds in Various Specimens

Parag Dixit **2:00 pm**
Variational Multiscale Methods to Embed Macromechanical Formulations with Fine Scale Polymers

Steven L. Creighton **2:20 pm**
Coupling a Fine-Scale Constitutive Equation into the Macroscale Equation of Motion via Variational Multiscale Techniques

Essam Al-Bahkali **2:40 pm**
A Steady State Solution of Thermoelastic Sliding Contact Bodies using Finite Element Method

Mahmoud I. Hussein **3:00 pm**
Frequency Domain Dispersive Modeling of Infinite Periodic Structures

Posters

Bio-Engineering

Alaa A. Ahmed **B-1**
Defining Loss of Balance using Adaptive Failure Detection

J. H. Blumenfeld **B-2**
Phenotyping a New Transgenic Mouse Model for Schmid Metaphyseal Condrosyplasia

Bing-Shiang Yang **B-3**
On Not Tipping a Stepladder

Solid Mechanics and Materials

Essam Al-Bahkali **S-1**
A Steady State Solution of Thermoelastic Sliding Contact Bodies using Finite Element Method

Design and Manufacturing

- Harsha Badarinarayan** M-1
Dynamic Air Brake System Modeling for Medium Size Trucks
- Nathan Bair** M-2
Design of a Reconfigurable Assembly System for Manufacturing Heat Exchangers
- Haseung Chung** M-3
Numerical Modeling of One-Dimensional Laser-Induced Melting and Solidification in Metals Subjected to Time-Dependent Heat Input
- Adam Cooper** M-4
Enterprise Driven Analytical Target Setting
- Karim Hamza** M-5
Design Optimization for Crashworthiness of Vehicles using Equivalent Mechanism Approximations
- Dejun Jing** M-6
Numerical and Experimental Study on the Flow of Fine Powders from Small-Scale Hoppers
- Chang-Ju Kim** M-7
Chip Formation and Cutting Forces in Micro-Milling
- Jeonghan Ko** M-8
The Impact of Product Architecture on the Reusability of Manufacturing Systems and the Environment

Dynamics, Systems and Controls

- Ashish Deshpande** D-1
Enhanced Mobility via Cooperation
- Jae Hong Lee** D-2
Real-time Simulation of Tracked Vehicles
- Don Lochner** D-3
Modeling, Identification and Air Flow Control of a Low Pressure Fuel Cell Stack with a DC Blower
- Haitham Mahmoud** D-4
Target Reduction and Balancing using System Norms
- Hyungpil Moon** D-5
Computing Equilibria on Superpositions of Logarithmic-Radial Potential Fields
- Szabolcs Sovenyi** D-6
Analysis and Cancellation of Vibration Feedthrough in Joystick Controlled Vehicles
- Jinzhong Wang** D-7
Development of Advanced Methodologies for Internet-Distributed Simulation

Fluid Mechanics, Heat Transfer and Combustion

Aristotelis Babajimopoulos **F-1**
Modeling the Effects of Gas Exchange Processes on HCCI Combustion

Christos Chryssakis **F-2**
Cavitation and Internal Flow Calculation inside a Diesel Injector VCO Nozzle

Udo Fissenewert **F-3**
Laser Spectroscopic Investigations of NO_x Formation in a Direct Injection Spark Ignited Engine Featuring Optical Access

Charles Funk **F-4**
Turbulence Properties of High and Low Swirl In-Cylinder Flows

Mong-Tung Lin **F-5**
Mixture Evaporative Characteristics Prediction using PSRK Equation of State for a LIF Liquid Fuel Film Measurement

Sneha Madhayan-Reese **F-6**
Novel Microfluidic Devices using Mobile Polymer Monoliths

Alan McGaughey **F-7**
Distinct Components of Lattice Thermal Conductivity

Tiffany Miller **F-8**
A Computational Study of Silane Combustion

Jin Hyun Nam **F-9**
Effective Diffusivities of Fibrous Gas-Diffusion-Layer