IUCRC - Cooperative Center Concept and Benefits to Industry

The National Science Foundation (NSF) Industry-University Cooperative Research Center (IUCRC) program provides industry, government, and research organizations the means to leverage research and development (R&D) investments with centers renowned for their innovative research capabilities.

- NSF program encourages collaborative research
- Focus on pre-competitive research
- Driven by industry to efficiently utilize the talents and resources of a university
- The NSF appoints an evaluator to ensure quality control
- Accomplishes research at a fraction of the cost
- Provides an avenue to investigate topics of common interest
- Allows industry to efficiently utilize the talents and resources of academic institutions
- Provides an excellent recruiting tool
- Leveraging: A nominal membership fee, when combined with cost-sharing and NSF money, gives members access to over $1M per year of research and associated intellectual property

Industrial Advisory Board (IAB)
- The IAB consists of one representative from each industrial member. The IAB consists of one representative (two for multiple memberships) from each industrial member.
- The board is responsible for evaluating current research thrusts, suggesting new opportunities, evaluating center operations, and matching center capabilities with unfilled research needs
- The IAB holds 2 meetings each year

Pre-Competitive Research Paradigm
- Overcomes basic obstacles that prevent a technology from being used in commercial applications
- Provides an understanding of the characteristics of new technologies
- Is aimed at providing the tools, information, and data that enables future products and services
- Offers equal benefit to all Center members
- Develops industry standards and test procedures where no precedent exists

Example SVC Sponsored Projects

- Interfacial Mechanisms: Characterization, Constitutive Modeling, System Integration (Sensors, Actuators, Dynamic Simulation)
  - Characterization and modeling of rubber bushings
  - Analysis of automotive system isolators
  - Inverse identification method for radiator mounts
  - Multiscale finite element simulation of the mechanical behavior of fiberglass insulation
  - Dynamic friction characterization of icy road surfaces

  - Smart condition detection and monitoring
  - Mechanoluminescent paintable light sources in automotive lighting systems
  - Embedded fiber optic sensors for structural health monitoring
  - Architecture for mechanoluminescent structural sensors and sensing platforms
  - Multifunctional structural panels with electroluminescence
  - Distributed programmable actuation platforms
  - Dynamic self-reforming lithium/solid electrolyte interface for solid-state battery

- Adaptive Noise, Vibration, and Harshness (NVH): Active Noise and Vibration Control, Adaptive Structures, System Integration
  - Morphing panels for aerodynamic performance
  - Multifunctional magnetostrictive systems: experiments and computer simulation
  - Multifunctional structural polymer composites for vehicle electrification
  - Flexible piezoelectric sensors for vehicle applications

- Emerging Vehicle Technologies: Vehicle Electrification, Autonomous Vehicles, Lightweighting
  - Vibration damping and energy harvesting
  - Effect of ultrasonic additive manufacturing (UAM) process on manufactured parts
  - Ultrasonic additive manufacturing: process modeling, structural reinforcement, multi-material joining reinforced polymers
  - Magnetic gears and geared drives
  - Smart restraints for autonomous vehicles

Smart Vehicle Concepts Center (SVC) History
- The Smart Vehicle Concepts Center was officially launched in July 2007 with support from NSF and industrial members
- Phase I: 2007 - 2012
- Phase II: 2012 - 2017
- Phase III: 2017 - 2022

- Texas A&M University joined SVC as an academic partner from summer 2008 to spring 2013
- SVC was renewed for another 5 years (Phase II: 2012—2017) effective July 1, 2012 as a single-site center
- SVC was renewed for another 5 years (Phase III: 2017—2022) effective August 1, 2017
**SVC Core Faculty**

**Marcelo Dapino**  
Honda R&D Americas Designated Chair  
Professor; Director of SVC  
*Expertise:* Smart materials; Nonlinear coupled systems; Design; Control

**J.P. Chen**  
Professor  
*Expertise:* Computational fluid dynamics; CFD simulation and coding; Turbulence modeling; Turbomachinery

**Hanna Cho**  
Associate Professor  
*Expertise:* Nonlinear NEMS/MEMS; AFM cantilever dynamics; Multi-functional ferroelectric material energy systems; Nano- and bio-science

**Ardeshir Contractor**  
Emeritus Professor  
*Expertise:* Advanced FEM; Modeling multiple response - Nonlinear NEMS/MEMS; AFM cantilever dynamics; Multi-functional ferroelectric material energy systems; Nano- and bio-science

**David Hoelzle**  
Associate Professor  
*Expertise:* Learning/adaptive control systems; Additive manufacturing processes; Microsystems for mechanobiology research; Dynamics systems analysis

**Raj Singh**  
Emeritus Professor  
*Expertise:* Noise & vibration control; Geared systems; Nonlinear dynamics; DSP

**Soheil Soghrati**  
Associate Professor  
*Expertise:* Advanced FEM; Modeling multiple response of advanced/bio-materials and structures

**Vishnu Sundaresan**  
Associate Professor  
*Expertise:* Piezoelectric materials; Active polymers; Bio-derived materials

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**SVC Companies**

<table>
<thead>
<tr>
<th>Company</th>
<th>Status</th>
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<tbody>
<tr>
<td>American Axle and Manufacturing</td>
<td>Former Member</td>
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<tr>
<td>Advanced Numerical Solutions</td>
<td>Former Member</td>
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<tr>
<td>Army Research Laboratory</td>
<td>Former Member</td>
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<td>Autoliv</td>
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<td>Battelle Memorial Institute</td>
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<td>BorgWarner</td>
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<tr>
<td>Bridgestone Americas Tire Operations, LLC</td>
<td>Former Member</td>
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<td>Eaton Innovation Center</td>
<td>Former Member</td>
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<td>Edison Welding Institute</td>
<td>Former Member</td>
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<tr>
<td>Ford Motor Company</td>
<td>Former Member</td>
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<tr>
<td>Goodyear Tire &amp; Rubber</td>
<td>Former Member</td>
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<tr>
<td>Honda R&amp;D Americas Inc.*</td>
<td>Current Member</td>
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<tr>
<td>Hyundai-Kia Motors*</td>
<td>Former Member</td>
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<td>LMS Software</td>
<td>Invited Observer</td>
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<td>MES, Inc.</td>
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<td>MIT Lincoln Laboratory</td>
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<td>Moog Inc.</td>
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<tr>
<td>MSC Software</td>
<td>Invited Observer</td>
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<tr>
<td>NASA Glenn Research Center**</td>
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<td>Owens Corning</td>
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<td>Parker Hannifin</td>
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<td>The Boeing Corporation</td>
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<td>Tokai Rubber</td>
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<td>Toyota Research Institute, Inc.*</td>
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<td>Transportation Research Center, Inc.*</td>
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<td>YUSA</td>
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*Indicates multiple memberships  **Invited Observer

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### SVC Mission

- Conduct basic and applied research on ground and aerospace vehicle components and systems
- Build an unmatched base of research, engineering education, and technology transfer with emphasis on improved vehicle performance
- Develop well-trained engineers and researchers (at the undergraduate, MS, and PhD levels) with both experimental and theoretical viewpoints

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### What Does SVC Offer?

- Comparative evaluation of existing materials or concepts
- Development of new sensors, actuators, and control algorithms
- New (revolutionary) design paradigms using smart materials
- Better understanding of vehicle constraints and environments
- New vehicle components and sub-systems
- New analytical and computational models
- Tools to improve vehicle development cycles and understand the limits of existing components

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### SVC Website

Please visit us online:

https://svc.osu.edu

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### Membership Fee Structure

For membership details, visit our page at https://svc.osu.edu/membership

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- Bridgestone Americas Tire Operations, LLC
- Eaton Innovation Center
- Edison Welding Institute
- Ford Motor Company
- Goodyear Tire & Rubber
- Hyundai-Kia Motors
- LMS Software
- MIT Lincoln Laboratory
- Moog Inc.
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- YUSA

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