



the Catalyst

Editorial Board

Subrata Sengupta, Ph.D., Dean
Keshav S. Varde, Ph.D., Associate Dean
Editor: Kathryn Tamborino

The Catalyst is published for the alumni and friends of the University of Michigan–Dearborn College of Engineering and Computer Science. Send correspondence to the Editor, *the Catalyst*, 4901 Evergreen Road, Dearborn, MI 48128-1491.

Regents of the University

David A. Brandon, Laurence B. Deitch, Olivia P. Maynard, Rebecca McGowan, Andrea Fischer Newman, Andrew C. Richner S. Martin Taylor, Katherine E. White, Mary Sue Coleman (ex officio)

Citizens Advisory Committee

Ismael Ahmed, Stephen T. Economy, Linda P. Kughn, Patricia Mooradian, Timothy J. O'Brien, Jon Pepper, Michael C. Porter, Maria Leonhauser Rosenau, Shirley R. Stancato

College of Engineering and Computer Science Departments

Department of Computer and Information Science
William Grosky, Chair
Phone: 313-583-6424
e-mail: wgrosky@umich.edu

Department of Electrical and Computer Engineering
Malayappan Shridhar, Chair
Phone: 313-593-5420
e-mail: mals@umich.edu

Department of Industrial and Manufacturing Systems Engineering
Swatantra Kachhal, Chair
Phone: 313-593-5361
e-mail: kachhal@umich.edu

Department of Mechanical Engineering
Ben Li, Chair
Phone: 313-593-5465
e-mail: benqli@umich.edu

Engineering Professional Development
Jeanne Girard, Director
Phone: 313-593-4000
e-mail: mjgirard@umich.edu

Centers of Excellence

Henry W. Patton Center for Engineering Education and Practice
Subrata Sengupta, Acting Director
Phone: 313-593-3403
e-mail: razal@umich.edu

Institute for Advanced Vehicle Systems
Roger Shulze, Director
Phone: 313-583-6431
e-mail: rshulze@umich.edu

Interdisciplinary Programs Center for Lightweight Automotive Materials and Processing
Pankaj K. Mallick, Director
Phone: 313-593-5119
e-mail: pkm@umich.edu

Henry Patton Center for Engineering Education and Practice Advisory Board

Hank Lenox (chair)
Ford Motor Company (retired)
Arthur Adlam, Jr.
Associate Director, Engineering Business Group
TACOM

Garrick Hu
Vice President, Advanced Engineering
ArvinMeritor, Inc.

Stuart Frey
TRW, Inc. (retired)

Robert Jensen
Executive Director, Electronics Engineering
Johnson Controls, Inc.

Roger A. McCurdy
Director
Advanced Product Development
TRW, Inc.

John Venious
Chairman and CEO
Acromag, Inc.

Nirmal Singh
Dielectric Scientist
DTE Energy Corporation

Al Ver
Vice President
Advanced and Manufacturing Engineering
Ford Motor Company

Kregg Wiggins
Vice President and Key Account Executive
GM KAM
Siemens VDO Automotive

Automotive Design Studio Offers Real-World Systems Design Experience

As part of its mission to further cross-disciplinary research in advanced vehicle design and manufacturing, the Institute for Advanced Vehicle Systems (IAVS) joined with the College for Creative Studies (CCS) in 2003 to create the Automotive Design Studio. Offered each year since, the Automotive Design Studio is a course designed to provide engineering and industrial design students the opportunity to learn and work together in a project-focused team environment and gain hands-on experience in the advance design and engineering of a major vehicle system.

"Our industry partners are very excited about the Automotive Design Studio," says Roger Shulze, director of IAVS. "Corporate sponsors thus far have included ArvinMeritor, Collins & Aikman, Sanyo America, Key Plastics, and Johnson Controls. Industry support extends beyond the purely financial, as students must present coursework for evaluation and critique to industry experts as well as to faculty."

Each Automotive Design Studio course is made up of two components. The first, a studio project at CCS, puts teams of industrial design students with engineering students to design a major automotive system, which is decided upon by the corporate sponsor for that course offering. Past systems have included a roof module for the low-mass vehicle, center consoles and rear-seat entertainment systems, a door module for the low-mass vehicle, and interior systems geared toward solving ergonomic problems encountered by drivers and passengers with special needs. During this phase, students visit industry plants to gain insight into design trends in the real world. The second component consists of individual studies projects worked on outside of the studio. Individual study topics are chosen by students and must relate to the overall studio project.



UM-Dearborn student Rhita Boufelliga and her CCS team member

Four to eight CECS students are chosen to participate in each Automotive Design Studio based on their academic records and the skills needed to complete the designated project. The course is open to juniors, seniors, and graduate students. Corporate sponsors provide full tuition reimbursement to students earning a B or better for the course.

"The Automotive Design Studio brings together students with disparate backgrounds and areas of expertise," says Shulze, "to enhance each other's knowledge of what it really takes to design and build an automotive system. Students from engineering and industrial design fields learn from each other and keep each other on track while exploring new, cutting-edge ideas in an industry context. It's an exhilarating educational experiment that has proven to be highly successful."

Course Credit for the Automotive Design Studio

UNDERGRADUATE STUDENTS:

Three credits will be given as an additional elective or the upper-level elective for the bachelor of science in engineering or computer and information science degree.

GRADUATE STUDENTS:

Automotive systems engineering (ASE) students can satisfy part of the capstone design requirement with the permission of the interdisciplinary programs director, the IAVS director, and the capstone advisor.

2005 Senior Design Competition

The ninth annual College of Engineering and Computer Science Senior Design Competition was held in 2005. A total of eight projects were entered into the competition. The departmental award winners were:

DEPARTMENT OF COMPUTER AND INFORMATION SCIENCE EDI Import Software

Team: Lars Anderson, Ahmed Bazy, Amin Beydoun, Michele Cote, Laith Solagh
Faculty Advisors: Bruce Maxim and Kiumi Akingbehin

The software module developed by this team is designed to enable customers of a specified company, such as a bank, to log onto the company system to retrieve, view, or export their data through a web interface. This data can be viewed from the web interface or exported into a format of the customer's choosing for download to the customer's server. The underlying technology pulls flat files (EDI) from an FTP server into a relational database.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING MIMO Communication

Team: Jason Gossiaux and Thomas Wilson
Faculty Advisor: Weidong Xiang

This team demonstrated that by using MIMO (multiple input multiple output) technology, the speed of a wireless communication system could be doubled. The group demonstrated the concept by constructing a communication system composed of a signal generator board in a PC computer, antennas at the sender and receiver, and software developed by the team. If adopted, the method of MIMO communication used in this design could double existing wireless data rates without the need for increased bandwidth usage. The use of a software radio allows for cutting-edge system flexibility and device interoperation.

DEPARTMENT OF MECHANICAL ENGINEERING Thermostatically-controlled Cup Holder

Multidisciplinary Team:
Mechanical Engineering: Richard Harris, Seda Melkumyan, Heather Papp, and Matt Perez
Electrical and Computer Engineering: Ibrahim Alkeilani and Ayman Mustafa
Faculty Advisor: John Cherng

This team designed a cup holder to automatically maintain a beverage temperature in an automobile environment. The cup holder is designed to be installed near the driver, and it operates using a mechanical and electrical control system to maintain the temperature of the cup at a specified degree. The team built a prototype that is capable of maintaining a safe temperature in both the cooling and heating modes. The testing of the prototype yielded satisfactory results.

The 2005 Senior Design Competition collegewide award was given to the electrical and computer engineering team for its MIMO communication project.



The mechanical engineering department interdisciplinary team

The Vetronics Institute

continued from page 1

Vetronics Institute projects to date have covered a wide variety of topics of interest to TACOM and other vehicle development agencies. Texas A&M studied various issues in electronic hybrid propulsion systems and developed simulation tools that allow evaluation of different approaches. University of Parma designed, tested, and developed vision algorithms to detect the human shape in unstructured environments, such as battlefields. The project aimed to increment safety and reduce accidents.

Oakland University performed a survey of human motor, perceptive, and cognitive processes with an emphasis on task automation, testing and evaluating crew station designs, and creating credible virtual actors and characters for simulations.

UM-Dearborn has spearheaded four research projects. The first looked at real-time, fault-tolerant control networks that could guarantee timely delivery of time-sensitive data in potentially harsh environments, including temperature extremes, shock, and vibration. Another project focused on terrain registration and depth perception to create virtual scenes from real landscapes in order to enhance robotic navigation, surveillance, and military training and operation. The third project involved the use of UWB radio systems in tracking and communications studies. The fourth project examines various issues in the development of DC power systems.

"The workshops and the research are very much integrated," says Richardson. "Researchers who receive funding through the institute present their findings at the workshops, and attendees gain some insight into topics of interest and can meet with and discuss potential joint projects with sponsors from various government organizations and industry. It has proven to be an excellent venue for collaboration and study within the field."

the Catalyst

News from the College of Engineering and Computer Science



HP-CEEP

Henry W. Patton Center for Engineering Education and Practice

IAVS

Institute for Advanced Vehicle Systems

CLAMP

Center for Lightweight Automotive Materials and Processing



Welcome Friends

It gives me great pleasure to report that The Center for Lightweight Automotive Materials and Processing (CLAMP) has received new funding from the U.S. Department of Energy to continue with its research activities and update the automotive materials curriculum. CLAMP was started in 1998 with an initial grant from DOE as a Graduate Automotive Technology Education

(GATE) Center of Excellence in Lightweight Automotive Materials. Our mission is to promote graduate education and research in lightweight automotive materials and processing.

While we are very encouraged to receive the new funding, much work lies ahead of us. With the first cycle of funding, the CLAMP faculty developed five graduate courses on automotive materials and offered them to graduate students in the automotive systems engineering program. In the next five years, we have proposed to develop five new courses: Fuel Cell Materials and Manufacturing, Automotive Design and Manufacturing for the Environment, Analysis of Lightweight Automotive Structures, Forming Process Modeling and Optimization, and Automotive Assembly Processes. All the courses will be web-based and can be taken either as part of our graduate degree program on automotive systems engineering or as a graduate certificate program on automotive materials.

In the last several years, we have been conducting research ranging from hydroforming of aluminum alloys to thermoplastic matrix composites for automotive applications. With funding from DOE, National Science Foundation, and the Society of Manufacturing Engineers, we have added new materials testing, processing, and characterization equipment to our laboratories. Our research agenda will continue with new vigor. We will continue to seek advice from industry for new research areas and submit proposals to support research programs in CLAMP. One of our new goals will be to provide testing services and conduct short-term exploratory research for industry. We will also initiate larger R&D projects involving hybrid materials for front-end structures, fuel cell manufacturing, and joining technology for advanced automotive materials.

Another goal will be to build a closer relationship with industry. We will explore several avenues to that end, including forming a consortium of companies with common R&D objectives; conducting experiments for individual companies; providing assistance to companies in materials selection, testing and process development; and offering automotive materials courses on the web. We will upgrade our web-based automotive materials database and make it available to industry. We will also organize several symposiums on advanced automotive materials technology. The first of these symposiums, in 2006, will be on fuel cell materials and manufacturing.

We would like to hear from you on how we can work with you to accomplish these plans as well as on your ideas for us. In the meantime, we thank you for your support and look forward to collaborating with you in the future.

Pankaj K. Mallick
Director of Interdisciplinary Programs

DOE Grant Supports New CLAMP Initiatives

The U.S. Department of Energy selected UM-Dearborn as one of eight universities to receive grant money to support and further develop Graduate Automotive Technology Education (GATE) centers of excellence. UM-Dearborn's Center for Lightweight Automotive Materials and Processing (CLAMP) received \$706,000 to develop new courses, improve and update existing courses, and expand and solidify its lightweight automotive materials database.

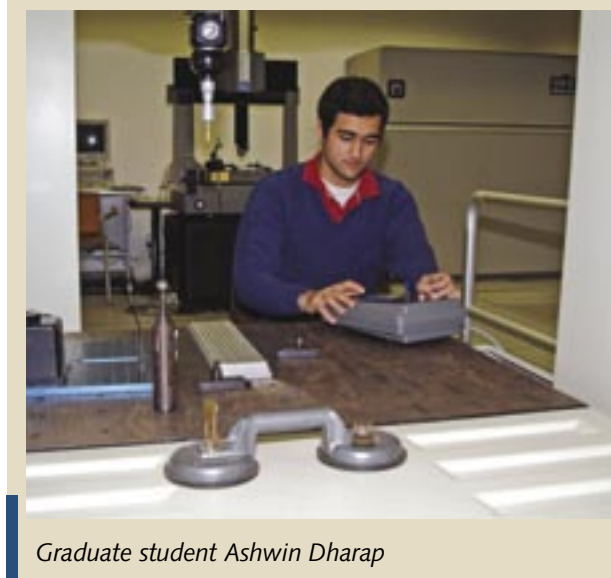
Established in 1998 with an initial grant from the GATE program, CLAMP was created to educate graduate engineering students on automotive materials and manufacturing processes and prepare them to design next-generation vehicles that would be lightweight, structurally safe, and fuel-efficient.

With this new grant, CLAMP plans to develop new courses on fuel cell materials and manufacturing, automotive design and manufacturing for the environment, analysis of lightweight automotive structures, forming process modeling and optimization, and automotive assembly processes. The courses will be incorporated into the interdisciplinary automotive systems engineering curriculum. Additionally, some new courses will be made available to industry professionals not pursuing

a degree at UM-Dearborn. "One of our goals with this grant is to ensure that the courses we develop will be much more accessible to outsiders, to outside industry," says P.K. Mallick, CLAMP director. "One of the ways we'll do that is to provide certificate programs in automotive materials for people who don't want a degree but do want to learn about new materials."

Some existing courses will be updated with case studies and real-life examples taken from recent automotive applications. These will be made available to the public through CLAMP's Lightweight Materials Database. The web-based database contains a combination of encyclopedic information on materials such as steels, aluminum alloys, magnesium, and plastics, with a section on research being done in the field. Access is free to anyone in academia or industry. "This grant will help us make the database more stable," says Mallick, "and allow us to publicize it a bit more to make people aware of it."

The grant will also be used to upgrade the material testing and corrosion laboratories and provide support to graduate students



Graduate student Ashwin Dharap

conducting research on lightweight automotive materials and structures.

"Ultimately," says Mallick, "this grant from the Department of Energy will help us further our goal of educating future engineers and managers about lightweight materials so that perhaps they'll come to adopt some of these technologies down the road."

The Vetronics Institute: A Forum for Research and Collaboration

Initiated by the U.S. Army Tank-Automotive Research, Development, and Engineering Center (TARDEC) in 2001, the Vetronics Institute was created to encourage cooperation and collaboration between developers of vehicle electronics and computer and software systems from within industry, academia, and government circles. The organization operates on two main tracks: bi-annual workshops and research.

Sponsored by TARDEC, the workshops provide a forum in which vehicle developers from academia and industry meet to present new information and results from the latest studies in the field. Last winter's presentation topics ranged from Bluetooth-based hybrid wireless harnesses for automotive applications to the performance and demonstration of ultra-wideband (UWB) radar for terrain sensing. Fourteen presenters addressed approximately 300 participants over a four-day period.

"The goal of the workshop series is to disseminate leading-edge material to engineers in the field and to bring them together under a common forum," says Paul Richardson, team leader of the institute and associate professor of electrical and computer engineering. "The workshops provide a venue in which vehicular engineers from different disciplines can gather and share experiences." There is no charge for the workshops.

Research projects make up the other focus of the institute. Recipients of awards for projects



Paul Richardson

under the Vetronics Institute include Texas A&M, University of Parma in Italy, Oakland University, and the University of Michigan-Dearborn. Funding for the projects totals approximately \$1 million over the past four years.

continued on page 2

The Catalyst provides news and information about the innovative projects being developed through the UM-Dearborn College of Engineering and Computer Science Centers of Excellence: Henry W. Patton Center for Engineering Education and Practice (HP-CEEP), Institute for Advanced Vehicle Systems (IAVS), and Center for Lightweight Automotive Materials and Processing (CLAMP).



The University of Michigan-Dearborn
College of Engineering and Computer Science
4901 Evergreen Road
Dearborn, MI 48128-1491

CHANGE SERVICE REQUESTED

Non-Profit
Organization
U.S. Postage
PAID
Dearborn, MI
Permit No. 684



Automotive Design Studio

Page 2



2005 Senior Design Competition

Page 2