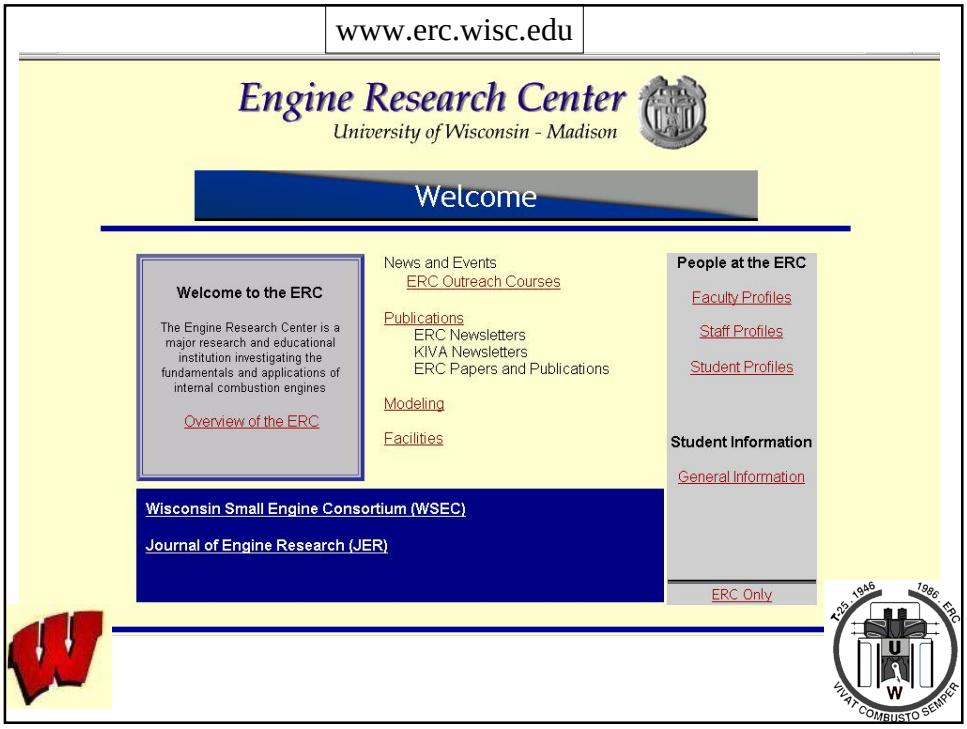
www.erc.wisc.edu



Engine Research Center

http://www.erc.wisc.edu/

- Largest academic research center focusing on internal combustion engines in the U.S.
- Over $3.5 million annual research budget
- Over 55 graduate students, 10-15 post-docs and visiting scholars, 8-10 research and administrative staff at any given time
- Engine Research Center
  - Primary focus is engine performance, combustion, emission control
  - Diesel and spark-ignition engine research
    - Experiments
    - Computer modeling

Engine Research Center Overview

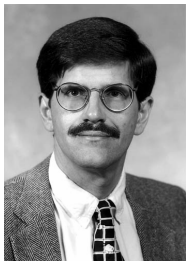
- Transportation power systems will continue to be a dominant social and economic force for decades to come
  - World passenger car fleet 1 billion by 2020 (w/o trucks, buses, off-highway)
- Transportation energy conversion and its environmental impact are critical to this country and the world
  - average auto travels 100,000 mi, consumes 4,000 gal. gasoline, 50 gal. oil,
  - discharges 35 tons carbon as gases + particles
- Why engine research at a university?
  - Conduct research that addresses a more distant horizon than industry
  - Provide industry with highly trained engineers who have conducted research on industry's future problems
- ERC research is devoted to the development, application and transfer to industry of new technologies

Engine Research Center Overview

- To provide to the worldwide transportation industry, government and academia, outstanding graduates trained in combustion engine research and fundamentals
- To provide cutting-edge research needed to meet national goals of reduced emissions and reduced fuel consumption and to meet the Army goals of high power density and fuel economy
- To provide a technically diverse faculty who are a national resource for information on combustion engine science and technology and a preeminent resource for information on internal combustion engine science and technology

ERC Faculty

Mike Corradini

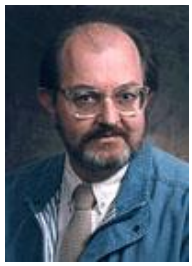


Pat Farrell

Dave Foster

Jaal Ghandhi

Rolf Reitz



Chris Rutland

Scott Sanders

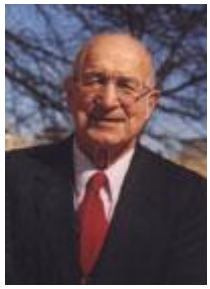
Active collaborations with other COE Faculty

ERC Associate Director

Kevin Hoag

ERC Emeritus Faculty

Gary Borman



Phillip Myers

Otto Uyehara

Associate Scientists:
Glenn Bower, Randy Hessel, Song-Charng Kong
Program Manager: Mike Redmond
Program Assistants: Sally Radecke, Monica Merry-Mason
Office Student hourlies: Susie Strzelec, Janet He
Computer SysAdmin.: Josh Leach Lab Specialist: Ralph Braun

Engine Research Center Overview

- In-Cylinder and Intake Flows
- Spray and Injector Studies
- Combustion/Ignition Fundamentals
- Lubrication
- Simulation tool development
- Diagnostic/instrument Development
- Powertrain Systems, Modeling, Diagnostics and Controls
- Emissions, after-treatment

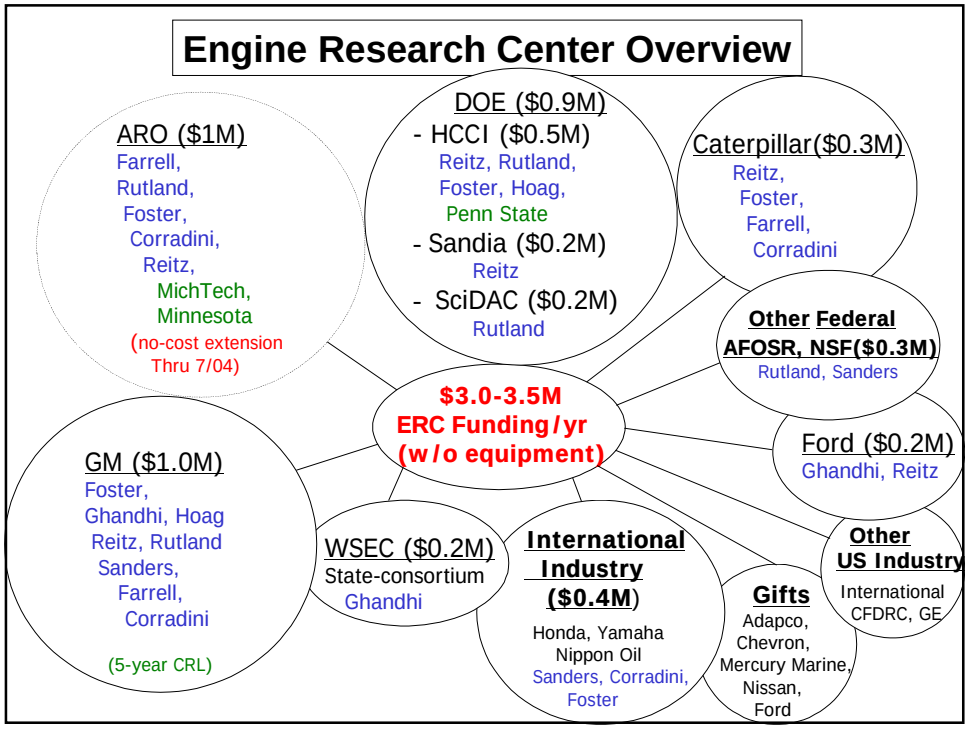
Research focus determined by sponsor priorities

ERC Facilities

- 18 Engine Test Stands
  - Six (6) Single Cylinder Heavy Duty Diesel Engine
  - Five (5) Smaller Single Cylinder Research and Flow Visualization Engines
  - Seven (7) SI and WSEC engines
- 10 Off-engine Experimental Development Labs
- Production, prototype injection systems:
  - Siemens, Orbital, Bosch, FIAT, Chrysler, Denso, Caterpillar, Cummins, Detroit Diesel Corporation and Lucas
- SGI Origin 2000 Super Computer (32 CPUs)
- High-end PC compute clusters: 32 node, 27 node, 4 node and 4 node
- Many Workstations and even more PC's
- 5 High Speed DAS, other time based PC DAS's

ERC Facilities (Cont.)

- Extensive optical diagnostic capabilities
  - 3 Cu-vapor lasers, 3 Nd: YAG, Excimer, 4 Argon ion ,
  - 2 PDA's, PIV, 3 LDV's, high speed cameras, movie and digital Kodak, Cordin framing camera, long distance microscope lens
  - Spectrometers, video frame grabbers, digital converters...
- 2 Bosch RTT and AVL DPL 482 Particulate Analyzers
- Two FTIR's , standard emission instruments:
  - exhaust HC, CO, NO, 2 full dilution tunnels
- Cambustion Fast-HC, Fast-NOx analyzers
- Bosch Optical Smoke Opacity /TEOM
- Machine shop
- Dark Room



Engine Research Center Overview

Technology Transfer

- Service on advisory/government panels (PNGV, CAFÉ, AAAV, BAST)
- Working group interactions (DOE CRADAs)
- Other universities (Michigan Tech, Minnesota, Michigan, Penn State)
- User Groups (KIVA)
- Electronic communication
  - Teleconferencing
  - Spray/Combustion software library on ERC web site
- Visitors residing in ERC labs
  International
  Industry
- Students spending time off-site

- Technical societies (SAE, ILASS, ASME ICE), Journal publications
- Consulting

Where are our Graduates?

- Industry
  - Virtually every major manufacturer of internal combustion engines boasts ERC graduates
  - Automobile and other vehicle manufacturers
  - Suppliers to the engine industry
- Government
  - National research laboratories
  - Regulatory agencies
- Academia

5 past Society of Automotive Engineers presidents
10 present/past members of SAE Board of Directors

Engine Research Center Overview

Summary - Accomplishing the ERC Mission

- Program involvement by students at all levels (undergraduate, graduate, post-graduate), in a manner that is representative of the diversity of our society
- A collaborative highly productive research environment for faculty/staff /student and industry participants

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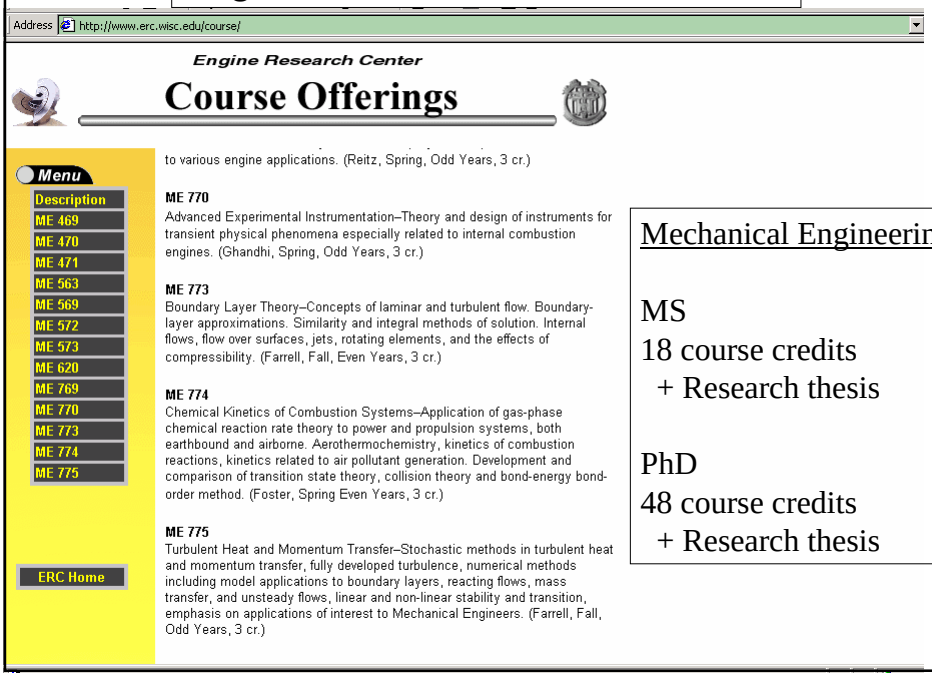
- Work is motivated by engineering problems
- New technologies applied to industrially-relevant research

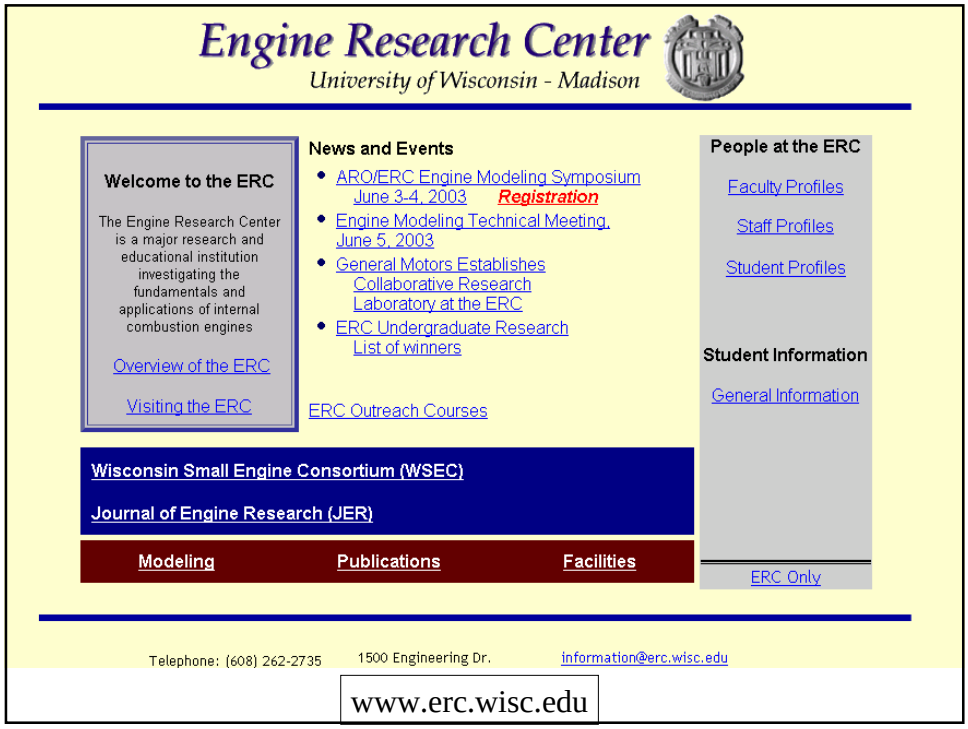
Engine Research Center Overview



Mechanical Engineering

MS
18 course credits
+ Research thesis

PhD
48 course credits
+ Research thesis


Engine Research Center
University of Wisconsin - Madison
Welcome to the ERC
The Engine Research Center is a major research and educational institution investigating the fundamentals and applications of internal combustion engines
Overview of the ERC
Visiting the ERC
News and Events
ARO/ERC Engine Modeling Symposium June 3-4, 2003 Registration
Engine Modeling Technical Meeting, June 5, 2003
General Motors Establishes Collaborative Research Laboratory at the ERC
ERC Undergraduate Research List of winners
ERC Outreach Courses
People at the ERC
Faculty Profiles
Staff Profiles
Student Profiles
Student Information
General Information
Wisconsin Small Engine Consortium (WSEC)
Journal of Engine Research (JER)
Modeling
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Facilities
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