Transport related research in Mechanical Engineering

- Transport related activities in the undergraduate and research programs
- PACE - The opportunities for Monash
- CRC Auto
Mechanical Engineering

- Four main degrees (Total graduations each year approaching 200).
  - BE (Mechanical)
  - BE (Aerospace)
  - BE (Industrial Engineering and Engineering Management)
  - BE (Mechatronics) (with EECS)
- About 70 post-graduate students
- 27 Academic staff, 30 post doctoral/research only staff.
BE(IEEM) at Clayton from 2005

- Only undergraduate degree of its type in Australia
- Modeled on US degrees from Universities such as University California at Berkeley, Stanford and Georgia Tech.
- Employment possibilities good
- Alumni since 1983
  - 55% in manufacturing
  - 45% in services.
- Postgraduates growing - unique offering in Australia
What is IEEM?

IEEM is about the design of the systems used in business and industry. It is about improving the way we produce and supply goods and services.

IEEM is different from other branches of engineering. IEEM is about how we do things rather than physical objects.
What is studied in IEEM?

- We study management systems.
- These systems have names such as
  - supply chain,
  - facilities and layout,
  - lean manufacturing,
  - quality systems,
  - safety and
  - project management.
Very high uptake of graduates in automotive sector

- Staff member Dr Damian Kennedy with Michael Nystasos, graduate.
- Michael is IT manager GM-Holden.
“Its engineering about people ...
Undergraduate final year theses in industry

- Many Final Year Projects are carried out in companies
- Some students take opportunities to work for one year in industry (between level 3 and 4).
- Industrial managers and alumni participate in our course
Co-operative Research Centres (CRCs) with transport elements

- Advanced Composite Structures (Αεροσπαχε)
- Railway Engineering
- Integrated Engineering Asset Management (includes Defence logistics)
- New 2005: CRC Auto
Mechanical Engineering
70+ research students

- We have many postgraduates doing research with transport interests
- Andrew McCormack is studying process planning with shape recognition.
The PACE Centre in Monash Mechanical Engineering and Art and Design
PACE Goals

- To integrate game-changing math-based tools and technologies (parametrics applications) into the curricula of key academic institutions:
- To provide a more highly skilled diverse candidate pool in engineering, manufacturing, & design
- To reduce the training time needed for new employees
- To promote UNIVERSITY TO INDUSTRY NETWORKS
- To promote global UNIVERSITY TO UNIVERSITY NETWORKS & collaboration
PACE Goals - continued

- To contribute to shrinking the time required to develop a vehicle from concept to product
- To provide feedback and new requirements to PACE Partners and PACE Contributors
- To improve the industry and academic standards in math-based design, engineering and manufacturing
PACE Institutions in North America

PACE Institutions in the U.S.
- Brigham Young University
- U-Texas-El Paso
- College of Creative Studies
- Kettering University
- MIT
- Michigan State University
- Michigan Tech
- Northwestern University
- Prairie View A&M University
- Purdue University
- Tuskegee University
- University of Michigan
- University of Missouri Rolla
- Virginia Tech
- Stanford University
- Howard University
- Georgia Institute of Tech.
- Lehigh University
- New Mexico State University
- Cornell University
- Rensselaer Polytechnic Institute

PACE Institutions in Canada
- Dalhousie University
- Queen’s University
- University of British Columbia
- University of Toronto
- Dalhousie University*
- University of Toronto
- University of Waterloo

PACE Institutions in Mexico
- Instituto Politecnico Nacional
- ITESM- ITAM
- ITESM- Estado de Mexico
- ITESM -Monterrey
- ITESM- Toluca
- Universidad Iberoamericana

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PACE Institutions in Europe

PACE Institution in Germany
Technische Universität Darmstadt

PACE Institution in Sweden
University of Trollhättan/Uddevalla
PACE Institutions in Asia Pacific

- **PACE Institution in China**
  - Shanghai Jiao Tong University
  - Tsinghua University

- **PACE Institution in South Korea**
  - Hongik University
  - Korea University
  - Sunghyunkwan University (SKKU)

- **PACE Institution in Australia**
  - Monash University
PACE Institutions in Latin America, Africa, and the Middle East

PACE Institution in Brazil
University of Sao Paulo (USP)
GM Engineering

Global Engineering Enterprise
Software

- Unigraphics Academic Partner Bundle
- Teamcenter Engineering
- Parasolid
- E-Factory Academic Partner Bundle
  - Factory CAD
  - Motion Capture Toolkit
  - Occupant Packaging Toolkit
  - Jack (& Jill)
- Sun Microsystems Software Suite (TBD)
Software, ct’d.

- MSC.Nastran
- MSC.ADAMS
- MSC.Akusmod

Altair® Hyperworks® CAE Suite

- FLUENT/GAMBIT
- LS-DYNA
PACE Design Competition

PACE - Partners for the Advancement of Collaborative Engineering Education - is a university and industry partnership to support strategically-selected academic institutions worldwide, to develop the automotive product life cycle management team of the future. PACE partners include GM, EDS, and Sun, with contributing companies such as HP, Altair Engineering and MSC Software. PACE has already provided over $10M in CAD/CAM/CAE hardware and software to the ME-EM department. You can click on images below to see a larger version.

First Place Team

Special Recognition 2nd Place Team
Demonstrated strength in design, engineering, and manufacturing fields related to systems and product design.

Current and intended curricula specifically involving automotive processes

Capability to provide recruits for GM, and the other PACE Industrial Partners

Projects in curricula that can support PACE-related projects
Product Design – Digital Mockup
E-factory/Teamcenter Manufacturing

- Integrated process, plant, resource data model
- Management tools for manufacturing planning:
  - change control
  - workflow
  - configuration mgmt
  - security
  - distributed databases
Teamcenter Community...built on “PLM Open”
JT File Format – enabling lightweight, Multi-CAD collaboration
Product Design - Ergonomics
Manufacturing Engineering –
Assembly Simulation

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Mechanical Engineering
CRC FOR ADVANCED AUTOMOTIVE TECHNOLOGY

- $38.35 million for a new CRC, to conduct engineering, design and manufacturing research that will enhance the industry’s international competitiveness
CRC Research Roadmap - Themes & Outcomes

**Education**
- Additional PhDs,
- Additional Industry based undergraduate final year projects,
- New Automotive focused degree,

**Virtual Engineering & Design**
- Virtual Design,
- No physical prototypes,
- Validation via computer simulations

**Safety**
- Reduction in Crashes per 100,000km
- Reduced probability of serious injury given injury,
- Reduced pedestrian and cyclist serious injuries

**Manufacturing**
- Supplier Logistics
- Agile manufacturing

**Environmental Sustainability**
- Fuel consumption reduction,
- Recyclable cars,
- Emission reduction,
- Average mass reduction

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Main CRC Partners/Supporters

Australian

Component Manufactures:

[Logos and images of various partners and supporters]