250 ACRE INNOVATION CAMPUS DEDICATED TO MOBILITY

LOCATED ALONG I-85 CORRIDOR BETWEEN ATLANTA & CHARLOTTE
Upstate South Carolina Regional Automotive Cluster

125 automotive suppliers and related companies in 10-county region

- BMW
- Michelin
- Freightliner, Detroit Diesel
- Bosch
- Bosch-Rexroth
- Cummins Marine
- BorgWarner
- ZF Transmissions
- Proterra
- ...

Source: Upstate Alliance
Department of Automotive Engineering: Vision & Mission

Focus on providing world-class automotive research, innovation and education

- Produce top-notch graduates for the automotive industry
- Pursue high-impact research topics critical for achieving sustainable mobility
- Support economic development by emphasizing industry relevance, and bridging pure research and translation!
Graduate Program, MS and PhD
Emphasis on Disciplines Critical for the
Automotive Field & System Integration

- Developed an automotive engineering curriculum from the ground up
- Introduced a pioneering concept of teaching vehicle system integration and product development – Deep Orange
- Grew the MS and PhD program to more than 200 students/year, approx. 60 PhDs
Industrial Relevance

INDUSTRY SPONSORED RESEARCH

7% UNIVERSITY AVERAGE

82% CU-ICAR
Working with some of the best in the world!
RESEARCH AREA STRENGTHS

• Materials and Manufacturing for Lightweighting
• Advanced Powertrain
• Vehicle Dynamics, Connectivity & Automation
• Human Factors
Automotive Engineering is not just a Mechanical field anymore. AuE Faculty cover a wide range of disciplines.
Undergraduate Certificate in Automotive Engineering

- Launches in Fall 2017
- Labs will be held on CU-ICAR campus
- Courses will be delivered at CU-ICAR and made available to students via streaming and online methods
Opportunities in the Automotive Sector

• Continued growth and technological innovation
  – New players are entering: Apple, Google, Tesla, Fisker, Elio, Faraday Future ....

• Everything about the automobile/mobility is changing
  – “The auto industry will change more in the next five years than it has in the last fifty” – Mary Barra – General Motors CEO

• Vehicles are becoming devices
  – Automotive engineers needs to be well-rounded - all skillsets are needed:
    • Mechanical, electrical, controls, computing, materials, human factors...
Automotive Industry – Economic Impact

- Auto production is the country’s largest manufacturing sector\(^1\)
  - 13 automakers, 44 assembly plants

- New record set in 2016 for # of new units sold in the US (17.55 million)\(^2\)

- $950+ billion into the U.S. economy every year through auto manufacturing\(^1\)

- 7.25 million auto-related jobs in the US\(^1\)
  - 5.6 million of these auto makers or suppliers

Sources
1: https://autoalliance.org/economy/
Automotive Industry - Growth

Domestic

US Vehicle Sales 2009 - 2016

- 80% domestic growth since 2009

Worldwide

Anticipated Growth by 2030:

- 65% Worldwide
- 100+% in emerging countries (since 2013)

Source: Federal Reserve Economic Data
https://fred.stlouisfed.org/series/TOTALSA

Source: Sumitomo Corporation
What’s in it for me?!

• Opportunity: gain relevant skills and experience with world class laboratories

• Exposure: differentiate yourself in the eyes of potential employers

**Clemson AuE’s Top Alumni Employers**
- Ford Motor Company
- Fiat Chrysler Automobiles
- BMW Group
- Cummins Inc.
- Honda R&D Americas Inc.
AuE Undergraduate Certificate Structure

- Consists of 12 credit hours, split across two semesters

**Fall Semester**
- Vehicle Dynamics with Laboratory
- Automotive Engineering Project Tools (Project course 1 of 2)

**Spring Semester**
- Powertrain Systems and Laboratory
- Automotive Engineering Project Prototyping and Validation (Project Course 2 of 2)
Fall 2017: AuE 4010/6010 Vehicle Dynamics Lec. & Lab

- Predict dynamic vehicle response with system analysis and physical system modeling
- Evaluate vehicle dynamic response
- Hands-on laboratory for practical skill development
Spring 2018: AuE 4020 – Automobile Powertrain Systems

Learn about all major powertrain systems:
- Hybrid Powertrain Design
- Internal Combustion Engines
- Batteries, Motors & Power Electronics
  - Emissions Systems
  - Thermal Management
- Control Strategies and Concepts
- Customer Preferences
- Regulatory Compliance

Vehicle Testing Laboratories:
- Experimental Methods
- Sensors and Instrumentation
- Data Acquisition
- Performance Evaluation
Fall 2017: AuE 4030 – Automotive Project Tools

Customer System Sub-System Assembly Component Testing Integration Refinements Build

Definition Development Release Product

System Requirements Component Integration Verification

Product Definition Development Release
Spring 2018: AuE 4040 Project Prototyping & Validation

- Design
- Experiment
- Instrumentation
- Data Acquisition
- Data Analysis
- Modeling
- 3D printing
- Machining
- Assembly
- Verification
Automotive Engineering Certificate - FAQs

• Costs:
  – $3,000 certificate fee
  – Scholarships & Fee Waivers Available!

• Scheduling:
  – Classes and labs on Friday at ICAR campus; online delivery available for lectures

• Who is Eligible:
  – Mechanical and Electrical Engineering students
    (pre-reqs include: ENGR 1410, ENGR 2080, and ME 3030 or instructor permission)

• Application Process:

www.CUautomotive.com

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