College Research Overview

November 2009
The College of Engineering has a strong research program in three strategic research areas: (1) **Advanced Materials**, (2) **Energy & Environment**, (3) **Biomedical/Biotechnology Research**.
Overall Research Areas

- All six departments in the College participate in some or all of the 3 strategic research areas. In addition, there are several other emerging and complementary research topics.
- Some of the most innovative research are happening at the interfaces of these 3 strategic research areas.
- More than 60 active research laboratories are located throughout the engineering complex.
- Beginning in 2005 externally funded research in the College has exceeded $10 million and continues to grow annually.
- Research in the College benefits from strong graduate programs in the departments, offering MS and PhD degrees.
Advanced Materials: Polymers

● The primary area of strength in advanced materials is *polymers* and *polymer nanocomposites*. This covers several faculty in many department and a wide variety of materials and applications, such as packaging materials, agricultural materials, membranes and biomaterials.

● The College is the home of the *Polymer Institute* led by Dr. Saleh Jabarin and offices of the *North American Membrane Society* overseen by Dr. Glenn Lipscomb.

● Sustainable materials made from renewable sources is a recent focus and has led to the establishment of the *Institute for Sustainable Engineering Materials* under the direction of Drs. Maria Coleman and Saleh Jabarin.
Advanced Materials: Continued

- Research on **semiconductor materials** is particularly strong in the College led by Dr. A.H. Jayatissa and including several other faculty.

- There is a strong research focused on **advanced ceramic materials** led by Dr. A.M. Azad and others.

- A recent focus has been on **nanomaterials** with faculty such as Dr. Lesley Berhan.

- Significant research on novel **biomaterials** development led by Dr. Sarit Bhaduri.

- **Materials characterization** research is led by Dr. Ali Fatemi, with the recent establishment of **CMSC** enhancing such efforts.
Renewable Energy Research

- The UT College of Engineering has become nationally recognized for research on biofuels with a team of faculty led by Dr. Sasidhar Varanasi. This team has received funding from several agencies, including DOE, NSF and ODOD.

- College has significant participation in the UT research effort on solar and advanced renewable energy, led by Dr. Thomas Stuart.

- Dr. Walter Olson leads the effort on developing hydraulic hybrid vehicles, with the opening of the Hydraulics Test Facility.

- The College is leading an effort to develop and deploy novel twin-blade wind turbines in Northwest Ohio with an emphasis on off-shore wind applications.
Environmental Monitoring

● The College has a long record of research on *air pollution monitoring* led by Dr. Ashok Kumar, and the College hosts the [Ohio Air Quality Research Database](#) and the [Ohio Radon Information System](#).

● Drs. Cyndee Gruden and Isabel Escobar’s research is on developing *sensors for detecting pathogens* in drinking water as well on waterways in Northwest Ohio, including Lake Erie.

● Drs. Defne Apul and Andrew Heydinger focus on *monitoring agricultural and landfill runoffs*.

● Several faculty, such as Dr. Youngwoo Seo, are developing *sensors for environmental monitoring*. 
Biomedical/Biotechnology Research

- The College is nationally recognized for spine research led by Dr. Vijay Goel. Recently, a group led that won a $4.46 million Ohio Research Scholars Program to establish an endowed professorship in the field of spinal implants.

- Several faculty in the College are involved in efforts to develop medical and environmental sensors, such as Dr. Brent Cameron’s work on non-invasive glucose sensors.

- Research on other implants and prosthetic devices are also underway: dental implants research by Dr. Sarit Bhaduri and development of assistive devices by Dr. Mohammad Elahinia.
Research Facilities

- In the last two years the College has established a series of research laboratories in the North Engineering Building: **Fuel Cell Laboratory, Small Turbine Laboratory, Multifunctional Materials Laboratory, Electron Microscopy and Materials Characterization Laboratory, Environmental Sensor Testbed** and the **Hydraulics Test Facility**.

- Most of the funding came from external grants with significant matching from UT. Total costs for these state-of-the-art labs was nearly $10 million.
Research Facilities: CMSC

- Until recently the Northwest Ohio region lacked a state-of-the-art facility for advanced materials characterization, which necessitated investigators to travel elsewhere or to have the work contracted out.

- The Center for Materials and Sensor Characterization (CMSC) was established in 2009 with ultrahigh resolution electron microscopes and other advanced characterization instruments.

- The Center is professionally managed with trained staff for the benefit of researchers at all universities and industries in the region.
Research Commercialization

- Research commercialization has been growing rapidly during recent years.
- Technology for producing ethanol from biomass developed by Dr. Varanasi and colleagues has been licensed by Suganit Systems.
- Dr. Cameron’s non-invasive glucose sensor technology has been licensed by Freedom Meditech with prototype development underway.
- Dr. Goel’s “golf exercise machine” has been licensed by Turning Point and prototypes are being constructed and tested.
For more information, please contact:

Office of the Dean
Attn: Mrs. Patty Mowery

Tel: (419)530-8000
dean@eng.utoledo.edu