Mechanical Engineering

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THE UNIVERSITY OF MEMPHIS

Research Focus Areas for the Department of Mechanical Engineering

For more than 10 years, the Department of Mechanical Engineering has sought to strengthen research programs in **Computational Mechanics** and in **Biomedical Engineering**: these remain two of the departments research foci. **Plasma Aerodynamics** has recently emerged as a potential third focus.

Computational Mechanics is the computational simulation of physical processes for the purposes of research or design. It encompasses sub-disciplines with recognizable acronyms such as FEA (Finite Element Analysis) and CFD (Computational Fluid Dynamics); department faculty have expertise in both of these areas. This area was chosen as a department focus because it does not require a large investment in physical facilities, and it has the potential to compliment research in a wide range of applications (such as the other two department research foci).

G. Lewis ..... FEA, applications to orthopaedic implants
H. H. Lin ..... FEA, applications to power transmission systems
G. Qi ..... FEA, applications to mechanical design and optimization
T. Tan ..... Computational simulation of complex kinematics and dynamic systems
J. Hochstein ..... CFD, applications to space processes, flows with surface tension. Fluid/Thermal Systems.
J. Marchetta ..... CFD, applications to magnetically induced flows, space processes, glass. V&V.
J. Mo ..... CFD, applications to high-speed flows and combustion

Collaborations with: NASA, DOE, LANL, ORNL, Boeing, Campbell Clinic, Medtronic, Memphis Restorative Dentistry, MTD, ORBITEC, Schering-Plough, Smith & Nephew, St. Jude Hospital, Thyssen, True-Temper, Wright Medical, BIOM, CHEM, EECE, PHYS

Biomedical Engineering applications of the fundamental principles of Mechanical Engineering is a traditional strength of the Department. Research was/is conducted on topics of national interest as well as topics of specific interest to industrial partners in the Mid-South. By its very nature, this research is interdisciplinary and there has been collaboration with industrial partners and other departments.

J. Hochstein ..... Flow dynamics of aneurysms
G. Lewis ..... Fatigue studies of biomaterials (i.e. UHMWPE, acrylic bone cement)
G. Qi ..... Acoustic Emission crack detection, implant fatigue
J. Ray ..... Heel strike dynamics, biomaterials
T. Tan ..... Shoulder/Arm/Wrist/Hand kinematics, biomaterials

Collaborations with: Whitaker Foundation, Campbell Clinic, Medtronic, Schering-Plough, Smith & Nephew, Wright Medical, BIOM, CHEM, PHYS

Plasma Aerodynamics is a relatively unexplored concept in which small amounts of plasma produce a large change in the behavior of a high-speed (supersonic) flow. Research is challenging because expertise is required in diverse topics such as shock wave behavior and plasma physics. Several members of the faculty of this department and the Department of Electrical & Computer Engineering already possess expertise in many of these topics. A collaborative effort with an industrial partner currently seeks federal funding to pursue research of this largely unexplored concept.

Faculty: J. Familoni (EECE), S. Griffin (EECE),
J. Hochstein (ME), J. Mo (ME), R. Warder (ME)

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