NASA
HBCU/MSI
Technology Infusion Road Tour

Challenger Learning Center/Florida A&M University
Tallahassee, Florida
September 27-29, 2016

Southern University and A&M College
My Contact Information:

Dr. H. Dwayne Jerro
Professor and Chair of Mechanical Engineering
Email: dwayne_jerro@subr.edu
Phone: 225.771.3580
SU Background
University Facts, Location, Mission, and Programs

Why Southern Fits
• SU Contracting
• Who Has Done Business With Us
• Capabilities Matrix Example

Selected SU Contracting Example
Selected SU Research Capabilities
Largest HBCU (Historically Black College and Universities) System in the country

Five Institutions, located on three campuses:
- Baton Rouge Campus
- New Orleans Campus
- Shreveport Campus
- Law Center
- Agricultural Research Center

System Facts
- 1881 opened in New Orleans, La
- 1890 Agricultural and Mechanical Department established
- 1891 recognition as a Land Grant College
<table>
<thead>
<tr>
<th>UNIVERSITY NAME:</th>
<th>Southern University and A&amp;M College</th>
<th>ADDRESS:</th>
<th>Southern University Baton Rouge, LA 70813</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESIDENT:</td>
<td>Dr. Ray Belton (President/Chancellor)</td>
<td>PHONE:</td>
<td>(225) 771-3890</td>
</tr>
<tr>
<td>EMAIL:</td>
<td><a href="mailto:ray_belton@subr.edu">ray_belton@subr.edu</a></td>
<td>ESTABLISHED:</td>
<td>1881</td>
</tr>
<tr>
<td>WEB SITE:</td>
<td><a href="http://www.subr.edu">www.subr.edu</a></td>
<td>MASCOT:</td>
<td>Jaguars</td>
</tr>
</tbody>
</table>
SU INSTITUTIONAL MISSION

To provide opportunities for a diverse student population to achieve a high-quality, global educational experience, to engage in scholarly, research, and creative activities, and to give meaningful public service to the community, the state, the nation, and the world so that Southern University graduates are competent, informed, and productive citizens.

SU RESEARCH VISION

The vision for research at Southern University and A&M College is to build and sustain an infrastructure that encourages greater participation by faculty in sponsored and elective research and related activities. The ultimate measurable outcomes of achieving this vision are that such research efforts would result in:

- an increased number of publications in refereed journals
- greater and more significant opportunities for its graduate and undergraduate students to participate in scholarly activities and research with their professors
- and building nationally reputable and competitive academic departments, colleges, schools, and centers through grantsmanship and contracting.
ENGINEERING:
Civil Engineering
Electrical Engineering
Mechanical Engineering
Electronics Engineering Technology
Master of Engineering

COMPUTER SCIENCE
BS - Bachelor’s Degree Program
- Scientific Option
- Information Systems Option
- E-Business Concentration

MS - Master’s Degree Program
- Programming Languages Software Engr.
- Operating Systems and Architecture
- Algorithms and Theory of Computing

- Supply Chain Management Concentration
- CS Minor
- Digital Data Communications
- Database Management and Data Mining
All Computer Science, Engineering and Technology Programs are Accredited by:

Accreditation Board for Engineering and Technology
Southern University & Contracting

Why SU Contracting?
Southern University uses a 6-step contracting flow model to ensure:

- Utilization of its Historically Black College and University capacity;
- Leveraged capability with Federal and corporate investments;
- Development of infrastructure resources and capacity to support services for multiple agencies;
- Formation collaborative relationships with small businesses large corporations, organizations, and other HBCU’s to support team for proposal development opportunities; and
- World class team has expertise and past performance to meet challenges such as planning, analytical laboratory services, engineering, logistical, communication, integration, and research and development.

SU Has More Than 16 Years of Experience
Southern University began its contracting career in 1999, and has since continued to build its expertise and contract service offerings to over 20 government and industry contractors. Throughout its contracting history, SU has been awarded more than $25 million in contracts from various agencies including: the US Army Corps of Engineers (Department of Defense), NASA, EPA, and the National Geospatial Agency.
Southern University 6 - Step Flow Model

1. **Agency Scope of Work**
   Request for Proposal (RFP)

2. **Assembly of Response Team**
   University, large, small, private business (teaming agreement)

3. **Contract/Subcontract Initiation**
   University Support Services (Office of Grants, Comptroller, Purchasing)

4. **Invoicing**
   Prime/Subcontractor

5. **Deliverables**
   Final Reports

6. **Closeout**
   University, Prime, Sub
Who Has Done Business With Us?

Government Agencies

NASA
NSF
Office of Naval Research
USDA
USD of Air Force
USD or Army
US Department of Commerce
USDoED
USDOE
USDHHS
USHUD
US Department of State
Who Has Done Business With Us?

Partners and Subcontractors

Archaeological Research Center
Bio Engineering
Boeing
Century Link
Ecological Specialists, Inc.
EM Assist
General Dynamics
Green Briar Wetland Services
Halcrow
HDR Engineering
IBM
Jacobs Engineering
Johnson & Johnson

Lockheed-Martin
Lucent Technology
MEL, Inc.
National Great Rivers Education and Research Center
Proctor & Gamble
Professional Engineering Consultants
Raytheon
Shaw Coastal
Shaw Environmental and Infrastructure
Spark-Hound
Texas Instruments
<table>
<thead>
<tr>
<th>Specific Areas of Expertise</th>
<th>Faculty Researcher Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense &amp; Avoid for Unmanned Airborne Vehicles (On-/Off-board)</td>
<td>Jiecai Luo</td>
</tr>
<tr>
<td>Rapid multispectrum image comparison and change identification</td>
<td>Zhengmao Ye</td>
</tr>
<tr>
<td>Image Fusion/Exploitation &amp; Large Area Displays</td>
<td>Fred Lacy</td>
</tr>
<tr>
<td>Electronics Based Sensors</td>
<td>M. A. Salam</td>
</tr>
<tr>
<td>Bio Sensors</td>
<td></td>
</tr>
<tr>
<td>Low cost radar sensor, sensor array, PED</td>
<td>Shuju Bai</td>
</tr>
<tr>
<td>Multispectrum image comparison</td>
<td>Shizhong Yang</td>
</tr>
<tr>
<td>Light weight power conversion.</td>
<td></td>
</tr>
</tbody>
</table>
### Southern University College of Engineering
Small/Diverse Business & Strategic Alliances

<table>
<thead>
<tr>
<th>Specific Areas of Expertise</th>
<th>Faculty Researcher Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shape memory polymer based self-healing composites</td>
<td>• Guoqiang Li</td>
</tr>
<tr>
<td>• Adhesively bonded composite joints</td>
<td></td>
</tr>
<tr>
<td>• Composite sandwich structures.</td>
<td></td>
</tr>
<tr>
<td>• Miniaturized robotics</td>
<td>• Ebrahim Khosravi</td>
</tr>
<tr>
<td>• Nano-composites</td>
<td></td>
</tr>
<tr>
<td>• Advanced Composite materials</td>
<td>• Fareed Dawan</td>
</tr>
<tr>
<td>• Morphing Polymers.</td>
<td></td>
</tr>
<tr>
<td>• Photo voltaic</td>
<td></td>
</tr>
<tr>
<td>• Smart Composites.</td>
<td>• Samuel Ibekwe</td>
</tr>
<tr>
<td>• Mechanical Characterization</td>
<td></td>
</tr>
<tr>
<td>• Thermal Barrier Coating for Aircraft Engines</td>
<td>• Shizhong Yang</td>
</tr>
<tr>
<td>• Heat Sinks for Micro-electronics</td>
<td>• Patrick Mensah</td>
</tr>
</tbody>
</table>
one Success Story
SU, Jacobs and NASA sign MOU – 2008

Areas of Support:
- Environmental program management and technical support
- Energy conservation technical support (assessments)
- Medical support, coordinated with medical services team mate
- Engineering and operational support
- Senior University membership in a MAF Operations Advisory Council
- Procurement of engineering, technical, support La Universities
SU, Jacobs and NASA sign MOU – 2008

Basic Ordering Agreement – Support Services HBCU-BOA-00
   ♦ more than 13 Task Orders issued

Areas of Support
   ♦ Environmental program management and technical support
   ♦ Energy conservation technical support (assessments)
   ♦ Medical support, coordinated with medical services team mate
   ♦ Engineering and operational support
   ♦ Senior University membership in a MAF Operations Advisory Council
   ♦ Procurement of engineering, technical, support La Universities
<table>
<thead>
<tr>
<th>Task Order No.</th>
<th>Description</th>
<th>Task Order Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBCU-BOA-00-001</td>
<td>Team Principle</td>
<td>$303,546.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-002</td>
<td>Environnemental Resource Documentation (LPDES Permit)</td>
<td>$28,820.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-003</td>
<td>MAF Laboratory Signage Compliance</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-004</td>
<td>Original Chemical Handling Report</td>
<td>$35,000.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-005</td>
<td>Modified Chemical Handling Report</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-006</td>
<td>Human Resources Administrative Support</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>HBCU-BOA-00-007</td>
<td>Energy / Water Conversation Audit</td>
<td>$224,000.00</td>
</tr>
</tbody>
</table>
Southern University and A&M College

technical & Research Capabilities
P.B.S. Pinchback Hall
117,000 Square feet
60% Lab Space

Moore Hall
Classrooms and Laboratories for EE & EET
Classrooms - 5 Multimedia-ready, 1 High Tech, 3 traditional, 2 dual-use, and 6 lab/lecture rooms

Laboratory Facilities - 33 Instructional Labs, 16 Research Labs with State-of-the-Art Equipment

Computing Facilities - ~ 500 Computers for Faculty & Students Loaded with Engineering Software Packages

Courseware Studio - Equipped with the Latest Software & Hardware for Professional Preparation of Course Presentation Materials

E-Mail & Internet Services - Accessible in All Labs, Offices, and Classrooms Enabling Us to Explore the Far Reaches of Cyberspace

Interactive Learning - Integrating Innovative Techniques into Instruction Such as CAVE (Computer Assisted Virtual Environment) ~ a 3D Virtual Reality System
- **Classrooms** - 5 Multimedia-ready & 4 lab/lecture rooms
- **4 Research Labs Bio** - Robo, HPC, Sensor
- **Computing Facilities** -
  - 200 Computers for Faculty & Students
  - **Clusters**
    - HP blades. 96 processors in total. Will upgrade to 120 processors
  - **Servers and workstations**
    - 2 servers. 12 cores each.
    - 15 workstations
- **LONI** - Free access to LONI facility
- **SEDE** - Free access to EXEDE facility
- **Courseware Studio** - Latest Software & Hardware for Course Presentation Materials
- **Wireless Internet Services**
- **Local DNS VM and E-Mail**
Labs: Solaris Lab 146, Student Lab 121, Classroom Lab 114, Programming Lab 125, Conference Lab 119, Graduate Research Lab 127.
Computation, communication, and information,
Advanced materials,
Nanomaterials, nanoscience, and devices, and
Energy and the environment.
computation, Communication & Information
CCI Groups

- **LONI Institute**
  - ♦ 3 Faculty Members with Computational Background in Materials Science & Engineering Computer Science, and Biology
  - ♦ Collaboration of Six Louisiana Institutions

- **Applied Sensor Technology Group**
  - ♦ Automatic Target Recognition (ATR), Electro-Optics/Infrared (EO/IR), and Radio Frequency (RF)
  - ♦ Wireless Sensor Networks

- **Simulation (CAVE)**
The CAVE is a room-sized advanced visualization solution that combines high-resolution DLP™ based stereoscopic projection technology and 3-D computer graphics to create the illusion of complete sense of presence in a virtual environment. The CAVE allows multiple users to immerse themselves fully in the same virtual environment at the same time.
**Graphics Computers**
The Centre for Immersive Virtual Environments main computer is a 10 processor Windows 2000 Cluster with 4 graphics pipelines.

**Stereo Glasses & Head-Mounted Display (HMD)**

**Interactive & Cyber Gloves:**
An Interactive Glove features advanced fiber-optic flex sensors to generate finger-bend data. Move easily through the virtual world by combining hand gestures with the pitch and roll of the user’s hand.
Research Areas

**Computational Materials**
- Materials Theory, Modeling, Computation & Analysis; Surfaces, Interfaces and Nanostructures; System On-Chip Design and Integration; Computational Modeling of Mechanical Behavior of Polymer Nanocomposites; Micro Electro-Mechanical Systems; Polymer Design and Synthesis

**Computational Biology**
- Metagenomics; Pulmonary Mechanics; Computational Biofluid Mechanics; DNA-based Detection; Phlogenomic Protein Identification; Understanding the Infection Mechanism

**Computational Science**
- Cactus Toolkit for Multi-Scale Simulations; SAGA; Distributed Data Management; Scheduling Services; Algorithms for Medical Data Integration, Mining and Discovery
Recent Projects

- Smart Adhesively Bonded High-Performance Joints for Composite Structures
- Testing and Modeling of Blast Response of Functionally Graded Composite Armor
- Elimination of Deck Joints Using a Corrosion Resistant FRP Approach
- Molecular Dynamic Simulation of Impact on Composite Material
- Development of Advanced Grid Stiffened FRP Tube-Encased Concrete Columns
- Composite Columns and Poles for Infrastructure and Homeland Security Applications
- High-Velocity Impact of Composite Cryotanks Subjected to Various Projectiles
Our state-of-the-art characterization capability can be utilized as a stand-alone service or as part of a larger research and development initiative.

**Capabilities Include:**

- SEM (Scanning Electron Microscopy)
- Chemical Analysis
- XPS (X-ray Photoelectron Spectroscopy)
- Hardness Testing
- Mechanical Testing
- Defect Analysis
Identify and select the appropriate material systems based on the application's operating conditions, and the cost, availability, and manufacturability of the feasible material systems.

**Reliability and Failure Analysis**

Identifying and Eliminating Potential Failures

**NSF-Center for Research Excellence in Science & Technology (CREST)**

Next Generation Composites Crest Center, or NextGenC³
Class 100 Cleanroom

♦ UV exposure station / mask aligner
♦ Photoresist spin coater
♦ Convection oven
♦ wet bench/fume hood
♦ RF and DC sputtering/deposition system
♦ Film thickness ellipsometer / profiler
♦ Low and High Temperature ovens

Research Project

♦ Piezoelectric Microcantilevers for Detection of Single Cells, and Micro-fabricated Reactive Oxygen Sensors
Clean Power and Energy Research Consortium (CPERC)

- Gas Turbine Systems (Reduction of fuel consumption, Improving reliability, Incorporating MEMS technology)
- Alternative Fuels (Biomass including sugar cane bagasse, land-fill gas, wood wastes, rice hulls, and corn cobs)
- Energy Conservation (Cogeneration...)
- Energy Education (workshop and short courses)

Energy Auditing Using Predictive Engineering
Recent projects

♦ Planning and Investigation Water Management Units
♦ Preliminary Planning and Investigation Swamp Water Management Units
♦ Wastewater Treatment Academic Training Center
HPC High Temperature Materials Design

- High Performance Computing Algorithms
- Cr-Y Alloy System
- Thermal Barrier Coating for Nb-Based Alloys
- Oxide Dispersion Strengthened Alloy Design
- Novel Thermal Barrier Coating for Turbine
Cr-Y alloy and oxidation

Ta doped YSZ optical property study

Gd-Yb-Y-ZrO2

Nb2AlC/Nb Alloy
sensor  Network
● Develop sensor network that will allow them to communicate with each other and work as a team.
● Each sensor node is a hardware unit having a small microprocessor and memory. The robot gathers environment data (sound, temperature, light, and humidity) with mounted sensors.
Sensor Module Description
♦ Develop computational framework for molecular dynamics simulation applications
  ♦ Begun work on a hadoop-based framework which will incorporate MPI to hadoop and handle data reuse in dynamics simulations

♦ Model Protein-Substrate Interactions
  ♦ Modeling of interactions between enzyme and ligands to help drug design targeting some diseases

♦ Implement Algorithms of Dynamics Simulation Sampling Methods on Various Computational Platforms
  ♦ Hadoop
  ♦ Work Queue
Computational Biomedical Projects

HSV gK/UL20p

Apocynin/1K4U

BPA /2E2R
Environmental, Fabrication & Monitoring Goals

- Temperature Changes
- Motion Detection
- Light Detection
- Object Detecting (walls, doors, etc.)
- Mapping
- Remote Monitoring and Control
Robotic Laboratory

- **Autonomous Control Concepts Testing**
- **Goals of Laboratory:**
  - Develop niche of expertise, and at the same time introduce students to state of the art robotics.
  - Enable students to bridge the gap between an academic and industrial environment, provide our student with the theoretical and practical training they need for their future career.
  - Teach the organization skills and work together to solve interdisciplinary problems. Provide them with advanced, up-to-date, hands-on training with robotics and other sensor network systems.
THE LOUISIANA QUALITY EDUCATION SUPPORT FUND 8(g)

Governmental logos and institutions: National Renewable Energy Laboratory (NREL), Lawrence Livermore National Laboratory (LLNL), Oak Ridge Institute for Science and Education (ORISE), EPSCoR (Experimental Program to Stimulate Competitive Research), and others.
For Contracting Opportunities, Contact:

Dr. Michael A. Stubblefield, Vice Chancellor for Research
P.O. Box 9272
Baton Rouge, LA  70815
Phone:  225.771.3890, ext. 206
Fax:    225.771.5231
Email:  michael_stubblefield@subr.edu

Dr. Samuel Washington,
Director of CEES (Home of the Office of Governmental Contracting Services)
Phone:  225.771.4724
Email:  samuel_washington@subr.edu