

**University of Nevada, Las Vegas  
Capability Statement**

Institution: **University of Nevada, Las Vegas, Howard R. Hughes College of Engineering**

DUNS No: **098377336**    Cage Code: **1K0W9**    NAICS ID(s): **611310**    SIC:

Federal EIN No: **88-6000024A3**

Certificates, Registrations, Accreditations:

POC Information:    **Mohamed B. Trabia, Ph.D., ASME Fellow**  
                          **Associate Dean for Research, Graduate Studies, and Computing and Professor of**  
                          **Mechanical Engineering**  
                          **Howard R. Hughes College of Engineering**  
                          **University of Nevada, Las Vegas**  
                          **4505 S. Maryland Parkway, Las Vegas, NV 89154-4005**  
                          **Phone: (702) 895-0957    Email: [Mohamed.Trabia@unlv.edu](mailto:Mohamed.Trabia@unlv.edu)**

## **OVERVIEW**

Since its first classes were held on campus in 1957, UNLV has transformed itself from a small branch college into a thriving urban research institution. As a doctoral-degree-granting institution, UNLV is host to approximately 30,000 undergraduate and graduate students who are served by approximately 3,900 faculty and staff members. UNLV offers more than 290 undergraduate and graduate degree programs. UNLV is classified by the Carnegie Foundation for the Advancement of Teaching as a *very high research status (R1) university*.

UNLV is among the nation's most diverse campuses for undergraduates, with more than half of its students from racial or ethnic minority groups. U.S. News & World Report's ranks UNLV as the *most diverse undergraduate campus* in the nation for the second year in a row while maintaining a spot in the top 10 most diverse universities for the eighth consecutive year.

UNLV achieved designation from the Department of Education as a Title III & Title V Minority Serving Institution (MSI) in 2012. Currently, UNLV meets the requirements as an Asian American, Native American, and Pacific Islander-Serving Institution (AANAPISI) and is a Hispanic Serving Institution (HSI).

The Howard R. Hughes College of Engineering (CoE) offers undergraduate Master and Doctoral degrees in the areas of computer science, civil & environmental engineering, electrical & computer engineering, and mechanical engineering. Additionally, the college offers degrees in aerospace, biomedical, construction management, materials and nuclear, entertainment, and transportation engineering. The CoE features several world-class laboratories with high-quality equipment. Our mission statement is "*Educate, Engage, Inspire, and Innovate,*" which indicates our commitment to balance academics, research, and community engagement.

With 76 full-time faculty, the college has created a well-rounded curriculum by combining practical and empirical knowledge with mathematical and scientific fundamentals and principles. The CoE has been on a growth track for the last seven years as indicated by the steady rise of our diverse student body, and the number of competitive grant proposals submitted and received. We emphasize a high-quality academic atmosphere and strive to create a dynamic and creative research environment for our students. The college has nationally recognized senior faculty along with dynamic junior faculty.

## **RESEARCH CAPABILITIES**

**Energy Systems:** UNLV can support NASA in the areas of identifying, design, building, and testing components and systems for generating and storage of power for successful manned missions including the planning, design, development, and testing of batteries and photovoltaic cells. A labs list in this area follows:

- Battery Performance Laboratory
- Center for Energy Research: Solar Site
- Solar Cells Laboratory

**Electrical Engineering:** UNLV supports planning, designing, and developing circuits, sensors, and communication hardware as related to the Civil Space Programs. Additionally, we can test these components and systems to assess

their ability to withstand thermal and mechanical shock. The Nuclear Engineering Laboratory is equipped to assess the performance of these components in a radiation-intense environment. A labs list in this area is as follows:

- Networking and System Integration Laboratory (NSIL)
- Laboratory for Security Science and Engineering
- The Nevada Nanotechnology Center
- Electronic Fabrication Facility
- Energy Materials Interaction Technology Initiative of Nevada (EMITION) Center

**Materials Engineering:** UNLV will support the effort of NASA as related to planning, designing, development and identification of materials with necessary physical and mechanical characteristics necessary to handle their intended environments, including temperature, shock, and radiation. We will also provide testing of materials and structures as needed. UNLV has developed ample laboratories and facilities for these purposes. A labs list in this area is as follows:

- Center for Materials and Structures: Mechanical Property Testing Facilities
- Active Materials and Smart Living Laboratory (AMSL)
- Material Performance Laboratory's Radiochemical Instrumentation
- Material Performance Laboratory's Radioanalytical Instrumentation
- Material Performance Laboratory's Solid Phase Characterization
- Material Performance Laboratory's Solid State Analytical Equipment and Laboratories
- Imaging and Electron Microanalysis Suite

**Mechanical Engineering:** UNLV mechanical and electrical engineering faculty can support NASA with planning, design, and development of mechanical products and systems such as instruments, controls, robots, engines, material selection and customization to meet various mission requirements. We can also aid the process of selection and design of machines and mechanical, thermal hydraulic or heat transfer systems for production, transmission, measurement, and use of energy. This includes planning, design, development, and testing of mechanical and/or electromechanical systems, instruments, controls, engines, and/or machines. Our Autonomous Systems Laboratory is a 625-square foot gantry, equipped with data acquisition systems for accurate positioning of loads. This gantry is also equipped with a 16-camera motion capture system.

**Mechanical Ground Support Equipment:** Once a design is completed, we deliver all relevant CAD models in accordance to the specifications and format. We are equipped to address design of manufacturing special tooling items, assembly fixtures, temporary protective covers, and shop aids used in the assembly of spacecraft, design of mechanical ground support equipment, verification of quality and accuracy of manufactured items upon completion, and analysis of tolerance stack-up, stress, thermal, dynamic, etc. to support verification of structural, dimensional, and interface requirements.

**Systems Analysis:** Support in the areas of systems integration as related to vehicle design, development, testing and verification is part of our research mission. Our faculty, staff, and students can provide NASA with systems analysis in the areas of environments definition, guidance navigation and controls, vehicle mass, thermal and power analysis, loads and dynamics, aerosciences, mission analysis, mass properties, and stress integration.

**Systems Engineering, Integration and Test:** UNLV can provide mission systems engineering support and securely deliver all soft products onto the NASA server in the appropriate format along with updated operations procedures and checklists, and additional support as related to performing technical planning, system integration, and verification and validation. Depending on the nature of the task, we conduct cost and risk analysis for the various task aspects, such as conceptual and engineering design, fabrication, testing, installation, operation, maintenance and disposal. We provide literature survey, functional and timeline analysis, and requirement allocation studies to help translate customer requirements into hardware and software specifications.

**Software Engineering:** UNLV will support planning, conducting, and coordinating software development activities. Our faculty will be able to design, develop, document, test, and debug software programs as related to logical and mathematical solutions of mission problems. Our faculty and students will answer questions in computer languages for solutions to these problems and ensure that program software standards are met.

**Specialty Engineering:** The CoE has expertise in various specialty engineering services that are of interest to NASA:

1. **Micrometeoroid and Orbital Debris (MMOD) Environments:** UNLV CoE has a two-stage light gas gun that can shoot projectiles with mass and velocity to simulate meteorite impact. We are also able to simulate these events accurately to reduce the need for extensive testing.
2. **Radiation Environments for Crew Exposure:** The Nuclear Engineering Laboratory has the ability to simulate and model a radiation environment.
3. **Nanotechnology Clean Room:** The room has equipment for the design, fabrication, and imaging of nano- and microstructures. The facility contains two rooms. One of the rooms has a class level of 1,000, meaning that it contains no more than 1,000 particles that are 0.5 microns or larger within a cubic foot; a second room is a Class 10,000-level clean room.

## **FACILITIES**

**Computational Capabilities:** UNLV secures its abundant computational abilities with multiple levels of firewalls. Additionally, our researchers have access to top-notch resources off-campus including Intel's Cherry Creek supercomputer consisting of: 26,000 cores, 22TB RAM, Peak Performance (Rpeak) 500TFlops, and Intel XeonPhi 31S1P cluster. The 48-node cluster in two racks is comprised of 12 Supermicro FatTwin Server Solutions with 48 2U half-width nodes.

**Machining Facilities:** We have a 2,500 square-foot state-of-the-art machine shops with extensive forming and machining, including several CNC machines and water jet cutters, and welding. The facility, located in the Science and Engineering Building, is secure, only accessible to staff and approved students, and dedicated to research. The shop has a full-time manager/machinist to ensure proper and efficient operation and maintenance. We have several 3-D printing machines including a metal 3D printer.

**Nuclear Engineering Laboratory:** Our faculty have active research programs in many aspects of nuclear engineering, including radiation detection and spectroscopy, active neutron interrogation and non-destructive assay of materials, prompt gamma neutron activation analysis, Gamma ray spectral analysis and radiation source identification, computational modeling of radiation transport, and nuclear systems design and analysis. The nuclear engineering laboratory has a separate 20 ft. × 12 ft. radiation vault. The laboratory is licensed for radioactive material handling and research. A suite of x-ray and gamma-ray sources is available for experimental work. A 2-Curie <sup>239</sup>Pu-Be source with a yield is 105 neutrons per second is available for experiments in the radiation vault.

## **PAST PERFORMANCE**

UNLV researchers have developed strong ties with key federal partners including:

- NASA and Jet Propulsion Lab
- Environmental Protection Agency
- U.S. Department of Transportation
- U.S. Department of Defense including: Army Research Office, Office of Naval Research, Naval Research Laboratory, Naval Air Warfare Center, and Defense Threat Reduction Agency
- U.S. Department of Energy including: Nuclear Regulatory Commission, Idaho National Laboratory, Los Alamos National Laboratory, Sandia National Laboratory, Oak Ridge National Laboratory

Additionally, we have a long-on-going collaboration with major contractors for:

- NASA: Lockheed Martin and Teledyne Brown and
- DoE: National Security Technologies, LLC, Mission Support and Test Services, LLC, Savannah River Nuclear Solutions, LLC.

Our faculty and students demonstrated success in many international events. For example, UNLV's Solar Decathlon 2013 entry finished first among American universities and second overall in the closest race in the competition's history. Similarly, UNLV was one of just 17 teams worldwide picked to compete in the 2017 U.S. Department of Energy contest. The team took first place for Innovation and second place for both Engineering and Architecture. Our team finished eighth among the world's best robotics teams competing in the 2015 U.S. Defense Advanced Research Projects Agency (DARPA) Challenge Finals.