ASU in Brief

- Welcomes 63,287 students from all 50 U.S. states and over 120 countries
- ASU Tempe campus has the nation’s largest enrollment (51,234 students)
- Offers 134 bachelor’s degrees, 119 master’s degrees, 52 Ph.D. programs and a J.D.
- ASU Freshmen Scholars: 188 National Merit Scholars, 609 Scholars, 1,006 Provost’s President’s Scholars, 691 University Scholars and 87 National Hispanic Scholars
Ira A. Fulton School of Engineering

- Dean Deirdre Meldrum
  Executive Dean Paul Johnson

- **NEW: Institute for Engineering Education ($4M)**
  - K-12 Programs
  - Teacher Training in Math/Sciences

- **9 academic departments:**
  - Harrington Department of Bioengineering
  - Department of Chemical Engineering
  - Department of Civil and Environmental Engineering
  - School of Computing and Informatics
  - Del E. Webb School of Construction
  - Department of Electrical Engineering
  - Department of Industrial Engineering
  - School of Materials
  - Department of Mechanical and Aerospace Engineering
Investment in Innovation

- Over $215M funded research at ASU; Engineering School delivered more than $50 million in research productivity this year

- Over 1M square feet of new research space added to ASU’s capacity since 2003

- The High Performance Computing Center (750,000 watts in only 1,200 sq. feet. It totals approximately 1,000 processors, each as fast as or faster than a single top-of-the-line desktop computer. The Saguaro cluster, is capable of sustained performance of more that four trillion computations per second (two teraflops) on 400 processors)

Infrastructure & Facilities

- MacroTechnology Works (Army Flexible Display)
- Biodesign Institute
- Arizona Biomedical Collaborative-1
- Interdisciplinary Science and Technology Building 1
- Interdisciplinary Science and Technology Building 2
- Brickyard complex on Mill
- Goldwater Center for Science and Engineering
- Engineering Research Center
Modeling and Simulation

- Arizona Center for Integrative Modeling and Simulation (ACIMS)
  - Collaboration between Arizona State University (Tempe) and University of Arizona (Tucson)

- Decision Theater

- Education Programs
  - Industry Seminars
  - Graduate Program
Arizona Center for Integrative Modeling and Simulation

• Co-Directors:
  – Dr. Bernard Zeigler (U-Arizona)
  – Dr. Hessam Sarjoughian (ASU)

• Research
  – Theory of modeling and simulation concepts, principles and methods
  – Development of theory-based tools that enable solving new and evolving classes of complex problems

• Education (Academic and Professional)
  – Online Master of Engineering in Modeling & Simulation
  – SCS Technical Council on Education, Training & the Profession
  – M&S Professional Certification Commission

• Outreach and Technology Transfer
  – RTSync – transitioning and support modeling and simulation technologies for use in government and corporations
  – Short courses and tutorials: e.g., I/ITSEC and Norwegian Defence Research Establishment

• Collaborators
  – Government and corporations: e.g., JITC, DISA, Northrop Grumman, Intel Corporation
Mechanical and Aerospace Engineering Simulation Activities

Broad Spectrum of Research under “Simulation Science”

• Use of High-performance computation to advance complex systems—computation used as a tool for discovery

• Diverse Research Applications
  – Flow control induced by dimpling a golf ball
  – Liquid jet breakup and atomization
  – Complete simulation of the flow around fighter aircraft

• MAE Leverages ASU High Performance Computing Initiative
  – Wide variety of compute and storage systems, thousands of processing cores
  – Applications provide students learning in all aspects of high-performance computing
Decision Theater’s Tools

- Laboratory that offers world-class capabilities combining advanced methodologies in Visualization, Simulation and Cognitive Sciences for advancing Policy Informatics.

- The core component, called the Drum, is a 260-degree faceted screen that can display panoramic computer graphics or 3D video content.

- The Drum accommodates up to 25 people and includes tools for collecting participant input and interaction. This advanced environment enabled individuals to see a detailed 3D representation of the consequences of behavior, decisions and policy in order to examine potential future scenarios in new & exciting ways.

- ACIMS has been one of the early collaborators in Decision Theater.
Modeling and Simulation Education Strategy

- Interdisciplinary M&S Master of Engineering

  Professional Graduate Applicants: 20 (Boeing, Army, Honeywell, General Dynamics, Intel)

  Course Enrollments: 500+

Required Core Courses (15 credit hours)
- CSE 561: Modeling and Simulation Theory and Application
- CSE 598: Software Analysis and Design
- CSE 566: Software Project, Process and Quality Management
- IEE 572: Design of Engineering Experiments
- IEE 545: Simulating Stochastic Systems

Elective Area Courses (students select 15 credit hours)
- CSE 543: Information Assurance and Security
- CSE 563: Software Requirements and Specification
- CSE 565: Software Verification, Validation and Testing
- CSE 591: Parallel and Distributed Simulation
- CSE 598: Distributed Software Development
- IEE 533: Scheduling and Network Analysis Models
- IEE 534: Supply Chain Modeling and Analysis
- IEE 566: Simulation in Manufacturing
- IEE 567: Simulation System Analysis
- CSE/IEE: 593 Applied Project

CSE: Computer Science and Engineering
IEE: Industrial Engineering

The unique academic focus will enable the design of simulation models, experiments, data analysis, and project management of complex M&S programs.
“Anytime-Anyplace” Distributed Learning

- High speed internet access
- Alternative modes of delivery/access
- Software requirements
Online Modeling & Simulation
Summary and Opportunities

• Instructional infrastructure and dedicated faculty offer professional students a path toward successful and timely degree completion across the globe.

• Graduates are well prepared to tackle complex critical problems and taking part in developing the next generations of simulation-based solutions.

• ACIMS is well positioned to continue helping reach new horizons in modeling and simulation capabilities and practices.
Examples of Current Related Graduate Education Activities

- Modeling and Simulation Graduate Program

- Modeling and Simulation courses are embedded in traditional graduate programs (EE, CSE, MAE, IE, others) to expose students computational methods and tools

- Applied research and applications to simulate and design manufacturing in the Army Flexible Display Center

- ASU Nursing Program at the LRC provides a learning environment for students to practice/master nursing skills in a simulation of clinical research in health care settings.
Undergraduate Education Activities

- BS in Mechanical Engineering with Concentration in Computational and Mathematical Engineering
  - Expose students to modern tools available for solving large-scale and complex technical problems
  - Prepare students for careers focused on high-performance computing and accurate modeling of large and small scale systems
  - Requires multidisciplinary electives in applied and numerical analysis, scientific computing, computational fluid dynamics, finite element analysis, computer aided design, and others

- BS in Computer Engineering
  - Expose students to methods and theory to develop simulation models and tools

- Global Engineering Design Lab
  - Senior Capstone Course – Mechanical & Aerospace Eng.
  - Leveraging Modeling and Simulation tools to develop regional private airliner
  - Global Teams linking students in ASU-Mexico-Asia
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