WELCOME

All Inclusive Board Meeting

November 13, 2014
APPLIED INFORMATION TECHNOLOGY

Aditya Johri – Chair
ABOUT US

- **Academic Programs**
  - BS AIT is the largest undergraduate major at Mason (1250+ students)
  - Popular MS AIT program (200+ students)
  - Participate in the School-wide PhD in IT and MS in DAE
  - Certificates and concentrations, including Intelligence Community Programs

- **Research**
  - Center for Secure Information Systems (CSIS)
  - Labs: Digital Learning; IT Entrepreneurship

- **Outreach**
  - STEM outreach
  - CISCO Networking Academy
STRATEGIC DIRECTION

- Vision: To expand human capabilities for social good through the application of information science and information technology.

- Mission: To engage and educate the best and brightest to meet the challenges of the knowledge society; conduct leading-edge research that integrates people, information and technology; and, contribute human and technical resources to address global problems and challenges.
STRATEGIC DIRECTION

Core Values:

- Equity and Access: Whom we educate and how we provide service is driven by our focus on equity and access – we educate community college students, provide online programs; offer classes across two campuses; evening classes for flexibility.

- Inquiry and Discovery: We focus on research-based advancement of the field and integrated research and education.

- Applicability and Adaptability: We are application driven; aligned with the industry; use a problem-based learning approach; and, we improve our offerings continuously.

- Engaged and Ethical: We are engaged with students, with each other, and our institution, and undertake our work with utmost regards to ethics.

- Innovation and Creative: We provide innovative programs and opportunities for our students; nurture creativity; and are future-oriented.
Social Implications of IT Use and Adoption
Learning and Educational Analytics
Cybersecurity, Privacy and Ethics
Big Data Application Across Domains
Department demographics:
- Department established in 2011, now with 9 tenure-track faculty
- ~200 undergraduate BioE majors
- PhD program beginning Spring 2015, accepted first student

Strategic direction of the Department – establish nationally recognized academic and research program in Bioengineering.
- Emphasis on translation and entrepreneurship for BS and PhD programs
- Leveraging Mason expertise in informatics –
  - Health care informatics concentration
  - Exploring big data/analytics intersection with BioE
- Fostering collaborations in the Washington DC metropolitan area including: NIH, Children’s National Medical Center, Walter Reed, NIST and the FDA
- Global opportunities – Carlos III in Madrid, Guatemala.
BIOENGINEERING

- Research Focus Areas:
  - Data Driven Biomechanics
  - Biomedical Imaging
  - Neural Engineering
  - Nano & Microscale Technology

Funding from NIH, DoD, NSF; Total amount from active awards ~ $6M
BIOENGINEERING

 Metrics to Evaluate Success:

- Triple research expenditures (5 years)
- Grow number of fully funded BioE PhD students from minimum of 5 (1 yr) to 10 (3 yrs) to 15 (5 yrs).
- Grow faculty from 9 tenure-track to 15 (5 yrs).
- Enhance collaborative activities across academic units, e.g. Krasnow Institute for Advanced Study, College of Health and Human Services (1-2 years) as evidenced by co-PI on grants, co-mentoring PhD students.
- Establish endowed/funded scholarships: 3 (2 years) and 5 (5 years)
- Advance distance education courses (lecture & lab) for BioE: 3 (3 years) to 5 (5 years)
- Foster entrepreneurial development – for senior design, increase industry participation and integrate business plan competition (2 years)
Bottom Line(s):

- Bioengineering is where multidisciplinary is mainstream.
- Our engineers speak multiple languages to lead teams to tackle biomedical challenges.
- Poised to capitalize on opportunities to leverage national laboratories and health care institutions in the Washington DC metropolitan area.
CEIE Profile by the Numbers

* 4 Degrees: BS-CIE; MS-CIE; MEng-GCS; PhD
* 400 Eager Undergraduate & Graduate Students
* 12 Outstanding Core Faculty
* 25 Leading Practitioner Adjunct Faculty
* 29 Dedicated Industry Advisory Group Members
* >100 Generous Major Donors
* 2 Distinguished Endowed Chairs
* Only Named Department at GMU
CEIE Undergraduate Highlights

* Full spectrum of CE Course Offerings
* Excellent Centerpiece Teaching Laboratory
* Research Opportunities for High-Performing Seniors
* Dedicated Civil Engineering Honors Program
* Coordinated Study Abroad Program in Ireland
* Transformational Student-Led Extracurricular Activities
  * ASCE Steel Bridge & Concrete Canoe Triumphs
  * EfID Projects in Peru and Nicaragua

[Image of students and projects]

[Image of students and projects]
CEIE Graduate and Research Highlights

* Signature Program Serving Research and Practice
* Research Proposals Submitted in 2013-2014 >$7M
* Expanding Research Facilities & Capabilities
* Leveraging Strategic Location in Northern Virginia
  * US Geological Survey
  * FHWA Turner Fairbank Highway Research Center
  * US Army Corps of Engineers Institute for Water Resources
  * Virginia Department of Transportation
  * NASA
  * National Academies
  * National Science Foundation
CEIE VISION

A Program of Choice:
* Peer to VT and UVA in Civil Engineering in VA
* Competitive in Mid-Atlantic for Undergraduates
* For Directed US and Foreign Graduate Students

A Program with Recognized Strengths in:
* Urban Civil Infrastructure: Integrity & Resilience
* Water and Environment: Sustainable Practices
* Energy: Sustainable Infrastructure Design

A Program that Leverages its:
• Partnership with Engineering & Construction Practice
• Integration of Distinguished Adjunct Faculty
• Outreach to Centers of Research Excellence
43 full-time faculty members
  - 37 tenured or tenure-track

Two undergraduate programs with 850 students
  - BS in Computer Science and BS in Applied Computer Science
    - BS in ACS = CS + a second discipline
    - Number of incoming freshmen in 2014 = 222 (> 100% increase since 2012)

PhD in Computer Science with 120 students
  - Ranked 63rd by US News and World Report (out of 180 programs)

Four MS programs with 425 students
Research expertise in almost all areas of computer science

- Strengths: Cyber-security, Machine Learning & Data Mining, Software Engineering, Computer Networks and Systems, Computer Vision and Robotics

- CS had $5M+ in research expenditures in FY 2014
  - Mason ranked 40\textsuperscript{th} nationally for research expenditures in CS by NSF (FY 2012)

- 10 NSF Career Awards and 1 AFOSR Young Investigator awards
  - 6 Mason Emerging Researcher awardees

- 2 ACM Fellows, 3 IEEE Fellows
VISION: To become a “world-class” computer science department

Strategic plan is characterized by two cross-cutting themes

- Inter-disciplinary thrusts in research and education
- Greater engagement with community
  - Industry, alumni, local K-12 schools
CYBER SECURITY ENGINEERING

Peggy Brouse - Director
The BS in Cyber Security Engineering (BS/CYSE) is designed to prepare students for the proactive engineering design of physical systems with cyber security incorporated from the beginning of system development; to create cyber-resilient systems.

The BS/CYSE is the first cyber security engineering degree in the country.

The program has been approved for initiation in Spring 2015.

The program was the first in Virginia to be approved through a new process at SCHEV – the “Facilitated Staff Approval Process”.

It is an interdisciplinary degree that will reside at the school level. Courses will be taught by faculty from five different VSE departments [AIT, CS, ECE, SEOR, STAT].

Cooperation from the departments to create cyber security engineering specific courses makes this a strong, interdisciplinary program.
Currently 29 students are taking first semester classes in anticipation of entering the program in Spring 2015

Participation from outside organizations has been very encouraging
  ▶ Senior Advisor for the program:
    Michael Papay, Ph.D., Vice President and Chief Information Security Officer, Northrop Grumman

Several initiatives underway
  ▶ Private Public Partnership Initiative (P3i) with US Army Reserve
  ▶ Viptela Corporation sponsorship of the Vulnerability Lab
  ▶ Transfer from NVCC into Mason

Future Direction
  ▶ MS Cyber Security Engineering
  ▶ CYSE certificate program
  ▶ ABET accreditation (1st graduates – Spring 2018)
The curriculum has four sets of requirements totaling 126 credit hours. They meet or exceed the following requirements:

- **University General Education** (42 hours)
- **Math and Engineering Courses** (19 hours)
  - MATH 113 Analytic Geometry & Calculus I (counted in University General Requirements)
  - MATH 114 Analytic Geometry & Calculus II
  - MATH 213 Analytic Geometry & Calculus III
  - MATH 203 Linear Algebra
  - MATH 214 Elementary Differential Equations
  - CS 112 Introduction to Computer Programming (counted in University General Requirements)
  - CS 222 Computer Programming for Engineers
  - ENGR 107 Introduction to Engineering (counted in University General Requirements)
  - PHYS 160 University Physics I (counted in University General Requirements)
  - PHYS 161 University Physics I Lab (counted in University General Requirements)
  - PHYS 260 University Physics II (counted in University General Requirements)
  - PHYS 261 University Physics II Lab (counted in University General Requirements)
  - STAT 344 Probability and Statistics for Engineers and Scientists
- **Program-specific courses** (56 hours)
- **Electives** (9 hours)

The additional 6 credit hours will not impede the four year graduation time.
BS CYSE CURRICULUM

Required Courses

- CYSE 101 Introduction to Cyber Security Engineering
- CYSE 205 Systems Engineering Principles
- CYSE 211 Operating Systems & Lab
- CYSE 220 System Modeling
- CYSE 230 Computer Networking
- CYSE 301 Digital Systems
- CYSE 325 Discrete Events Systems Modeling
- CYSE 330 Introduction to Network Security
- CYSE 411 Secure Software Engineering
- CYSE 421 Industrial Control Systems (ICS) Security
- CYSE 425 Secure RF Communications
- CYSE 430 Critical Infrastructure Protection (seminar)
- CYSE 445 Systems Security and Resilience
- CYSE 450 Cyber Vulnerability Lab
- CYSE 465 Transportation Systems Design
- CYSE 470 User Experience Engineering (seminar)
- CYSE 475 Cyber Physical Systems
- CYSE 491 Engineering Senior Seminar
- CYSE 492 Senior Advanced Design Project I
- CYSE 493 Senior Advanced Design Project II

Elective Courses (9 hours from the following)

- CYSE 424 – Embedded & Real Time Systems
- CYSE 460 – Power Systems & Smart Grid
- CYSE 461 – Power Grid Security
- CYSE 462 – Mobile Devices and Networks Security
- CYSE 467 – GPS Systems
- CYSE 476 – Cryptography and Computer Network Security
- CYSE 477 – Intrusion Detection
- CYSE 478 – Security Testing and Audit
- CYSE 479 – Methods of User Authentication
- CYSE 480 – Malicious Software and Hardware

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MS COMPUTER FORENSICS
MS DATA ANALYTICS

Bob Osgood - Director
CFRS & DAEN VISION

Maintain a Leadership Role in the Areas of CFRS and DAEN

11/4/2014 DAEN Symposium with IBM – 180 Attended

1/7/2015 Computer Forensics Symposium with Infragard
CFRS & DAEN

- Mason’s Customer Base:
  - Working Professional
  - Government
  - Corporate

- Departments Involved:
  - AIT, CS, ECE, SEOR, & Statistics (A true team effort!)
    - Bioengineering coming on board for the fall 2015.

- 30 Credit Programs (can be completed in 2.5 years part-time)

- 5 Concentrations (DAEN):
  - Applied Analytics
  - Data Mining
  - Digital Forensics
  - Predictive Analytics
  - Statistics for Analytics
CFRS & DAEN

- **Strategic Direction**
  - Expand the CFRS and DAEN Programs

- **Metrics Used**
  - Students, Students, Students

- **Research Focus/Opportunities**
  - New CFRS Research Lab
  - NIST Forensic Sciences Center of Excellence (FSCE) – Serious Contender
  - DAEN – Department Driven
  - CFRS DAEN Research Group

- **Elevator Slogan**
  - Identifying What Industry Needs and Meeting That Need!
http://dataanalytics.gmu.edu
http://cfrs.gmu.edu
ELECTRICAL AND COMPUTER ENGINEERING

Monson H. Hayes - Chair
ECE’S STRATEGIC DIRECTIONS

▸ Research
  ▸ Foster and promote multidisciplinary research projects with VSE and across the colleges and schools at GMU.

▸ Education
  ▸ On-line courses, professional education, and certificate programs.

▸ Regional and Global Initiatives
  ▸ Global outreach though strategic partnerships and agreements.
  ▸ Recruiting and retaining the best students in Virginia.
  ▸ Research and development partnerships with VA industry.
METRICS TO EVALUATE PROGRESS

- **US News and World Report**
  - National ranking is an important benchmark for recruiting, and is tied to visibility and perception of excellence through publications, research, and service.

- **Metrics tied to the USNWR Ranking and RU/VH Classification**
  - Number of Research Awards
  - Number of Ph.D. Degrees Awarded

- **Other Metrics**
  - Growth in undergraduate and graduate enrollment
RESEARCH FOCUS/OPPORTUNITIES

- Cyber physical systems and security - Links to Cyber Security Engineering
- Cryptography
- Computer forensics
- Robotics and intelligent vision systems
- Big data analytics using high-dimensional and robust statistical signal processing
Electrical Engineering

“Electrical Engineering at Mason deals with electronic systems that range from the smallest of microchips to large, complex systems such as communication satellites, robots, and power distribution networks, and with the sensors, systems, and devices that capture and store signals in digital form, and the algorithms that process, compress, and extract information from this digital data.

Computer Engineering

“From cloud computing to smartphones and the internet of things, computer engineering at GMU is a program that provides the path to ubiquitous, sustainable, secure, and green computing.”
MECHANICAL ENGINEERING HISTORICALLY

MECHANICAL ENGINEERING EVOLUTION

Access
And
Enrichment
NATIONAL STATISTICS

- 23 Engineering Programs in 2013
- BSME awarded 21,707 of the 93,423 degrees. BSCE awarded 12,464.
- BSME graduated 2,713 women engineers (12.5%). BSEnE which graduated 455 (45.8%).
- BSME programs enrolled 22.1% or 120,083 of the 543,942 students.
- MSEE graduated 6,305 students. MSME graduated 6,261.
- PHD programs graduated 10,764. PHD ME were 1,454 (217 women)
THE PROGRAM

To expand the academic and intellectual culture of the Volgenau School of Engineering leading to distinct innovations that will benefit society.

BSME

- Traditional Experiences in engineering science and design
- 121 credits
- 12 credits of Electives
- ABET

Tracks

- Aerospace Engineering
- BioEngineering
- Building Engineering
- Manufacturing
- Robotics
THE PROGRAM

To expand the academic and intellectual culture of the Volgenau School of Engineering leading to distinct innovations that will benefit society.

Enrichment
- NAE Grand Challenge Scholars Program
- Research
- Interdisciplinary
- Global Experience
- Service
- Entrepreneurship

Access
- NOVA Dual Admission Compact
- NSU Dual Degree Program
SYSTEMS ENGINEERING
AND
OPERATIONS RESEARCH

Ariela Sofer - Chair
A SNAPSHOT OF SEOR

- 19 full-time instructional faculty
- Academic Programs
  - BS in Systems Engineering 180 students (85 in Fall 09)
  - MS in Systems Engineering* 100 students (135 in Fall 09)
    - MS in Operations Research 50 students
  - PhD in SEOR 30 students
- Graduate Certificates
- Participant in MS DAE, and other school-wide programs
- Long record of providing contract courses, short courses to industry

* Available also via asynchronous on-line
SEOR HIGHLIGHTS

- Ranked 28th by US News & World Report in graduate programs in Industrial/Manufacturing/Systems Engineering 2013
- BSSE teams consistently win first place awards in national capstone competitions. Just since 2010:
  - 11 Best Presentation awards at Gen. Keith Capstone Conference, USMA
  - 9 Best Paper awards at IEEE SIEDS Conference, UVA
- SEOR FY14 expenditures ~ $2.4 million
- SEOR faculty scholarly achievements
  - Over 40 published books
  - Fellows of professional societies
  - Presidents of professional societies
  - Frequent conference organizers, plenary speakers
SEOR RESEARCH

- Air Transportations Systems
  - Unmanned air systems, safety, congestion mitigation, dynamic pricing and auctions
- C4I, Defense and Security
  - Multisource fusion, situation assessment, Bayesian networks, cybersecurity, military operations research, evidence marshaling
- Data Analytics
  - Modeling, simulation, and optimization, with applications to
    - Health care and medicine, energy, nanomanufacturing, finance
- Systems Architecting
  - Model-based systems engineering, complex adaptive systems, validation and verification, risk mitigation
THE SEOR ESSENCE

► We are relatively small. But we are strong.
► Our strength has been, and will be in:
  ► The quality and reputation of our academic programs
  ► The quality and reputation of our research and our faculty
► We are guided by
  ► Our collaborative, flexible, can-do spirit
  ► Our strong focus on research with broad societal impact
  ► Our willingness to do what we believe is academically right
  ► Our long tradition in taking on novel teaching methods
Statistics

William Rosenberger - Chair
Daniel Carr – Presenter
GOALS

Research:
- Become internationally prominent by distinguished achievements in cutting-edge research.
- Position ourselves strategically in research areas likely to be of significant importance at a national and international level over the coming years.

Teaching:
- Provide students with knowledge of statistical techniques, experience with using these techniques in applied situations, and an understanding of the theoretical foundations behind them.
- Prepare students for professional employment in industry or government and for more advanced degree programs.
Statisticians are valued contributors to any project involving stochastic phenomena and data.

- **Biostatistics**: diagnostic medicine, design and analysis of clinical trials, statistical genetics.
- **Probability**: branching processes, risk theory.
- **Knowledge Visualization**: statistical graphics, data exploration.
- **Computational Statistics**: data analytics, analysis of massive data sets.
- **Biometric Identification**
- **Network Analysis and Machine Learning**
- **Statistical Education**
PROGRAMS

- Graduate Certificates (10 students):
  - Federal Statistics (focus on both applications and theory)
  - Applied Statistics (focus on applications) – New Fall 2015

- MS degrees (65 students):
  - Statistical Science
  - Biostatistics
  - Data Analytics Engineering (Concentration in Statistics for Analytics)
  - Dual: Statistical Science and Operations Research
  - Dual: Statistical Science and Mathematics

- PhD degree: Statistical Science (20 students)
FUTURE PLANS

► Research
  ► Identify more interdisciplinary opportunities that require statistical support.
  ► Establish collaborations with other Mason departments and centers.

► Teaching
  ► Adapt courses at both the undergraduate and graduate level to keep pace with the needs of an increasingly data-driven society.
  ► Deliver more courses in a hybrid design to accommodate working adults.
  ► Increase enrollment in MS and PhD programs through competitive research and teaching assistantships.

► Community Outreach
  ► Enhance experience of high school students taking AP statistic classes.
  ► Provide training in teaching statistics for K-12 teachers.
THANK YOU!