NC State Engineering

Spring 2017 Overview

Academics
Departments in the College of Engineering
Biomedical Engineering
Chemical and Biomolecular Engineering
Civil, Construction, and Environmental Engineering
Computer Science
Electrical and Computer Engineering
Edward P. Fitts Industrial and Systems Engineering
Materials Science and Engineering
Mechanical and Aerospace Engineering
Nuclear Engineering

Departments in other colleges
Biological and Agricultural Engineering
Forest Biomaterials
Textile Engineering, Chemistry and Science
Among all U.S. engineering colleges*
- 9th in BS degrees awarded
- 11th in MS degrees awarded
- 13th in PhD degrees awarded
- 13th in Undergraduate enrollment
- 7th in Total enrollment
* ASEE Profiles 2015

Students

Fall 2016 Enrollment   2015-16 Graduates
Undergraduate    6,733   Bachelor’s    1,488
Master’s         2,057   Master’s      991
PhD              1,258   PhD           181
Total            10,048   Total         2,660

Enrollment Growth

- Undergraduate enrollment increased by 18% or over 1,000 in the last decade
- Quality of entering freshmen improved with more than 70% in top 10% of high school class
- Master’s enrollment has more than doubled in last decade with 17% growth in last five years
- Doctoral enrollment has increased by 55% in last decade
- Total enrollment has grown by 34%, from 7,467 to 10,048, over last decade
Diversity Profile

• 2nd in BS degrees awarded to African Americans among non-HBCUs*
• 17th in BS degrees awarded to women**
• 12th in MS degrees awarded to women**
• 15th in PhDs awarded to women**
• 14th in number of African American T/TT faculty**
• 10th in number of women T/TT faculty**
• Women and Minority Engineering Programs, co-recipients of the 2015 Claire L. Felbinger Award for Diversity

* Diverse Issues in Higher Education  ** ASEE 2015 data

Faculty

• 290 tenured and tenure-track faculty members
• 17 members of the National Academy of Engineering
• 2 National Medal of Technology and Innovation recipients
• 2 North Carolina Award for Science recipients
• 1 US Army Commander’s Award recipient
• 1 Emmy Award winner
• 3 National Inventors Hall of Fame members
• 6 National Academy of Inventors members
• 3 among AIChE 100 Engineers of the Modern Era
• 40 NSF CAREER Awards since 2006, or 4 per year on average
• 1 Presidential Early Career Awards for Scientists and Engineers (PECASE)
• 5 Presidential Mentoring (PAESEM) Awards
Research Expenditures 2009-2015

- Research expenditures have grown from $129 million to $180 million, or 39 percent since 2009-10.
- 11th overall and 7th among public COEs in the US in total research expenditures* 

*ASEE 2014 data

NC STATE VISION

NC State University will emerge as a preeminent technological research university recognized around the globe for its innovative education and research addressing the grand challenges of society.
Emphasis on the integration of research and education

COE STRATEGIC VISION

Engineering Health Systems
Bioengineering
Nanotechnology
Robotics & Sensor Technology
Advanced Materials & Manufacturing
Energy & Environmental Systems
Transportation & Logistics
Information & Communications Technology
Security & Critical Infrastructure

NC STATE Engineering

NSF ENGINEERING RESEARCH CENTER COMPETITION

- Highest level of competition among colleges of engineering for National Science Foundation (NSF) funding
- Largest and most prestigious awards offered by the NSF Engineering Directorate … $40 million over 10 years
- 100+ universities compete in first round
- 16 or fewer are site visited
- 8 or fewer are invited for Blue Ribbon Final Competition
- 4 or fewer are eventually awarded
In its history, NC State has received three NSF ERCs:

- 1988 – Center for Advanced Electronic Materials Processing (AEMP)
- 2008 – Center for Future Renewable Electric Energy Delivery and Management (FREEDM) Systems
- 2012 – Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

NC State is one of only two universities ever to receive three ERCs and currently leading two ERCs.

**NAE Grand Challenges for the 21st Century**

- **Sustainability**
  - Make solar energy more economical
  - Provide energy from fusion
  - Develop carbon sequestration methods
  - Provide access to clean water
  - Manage nitrogen cycle

- **Health**
  - Advance health informatics
  - Engineer better medicines
  - Reverse-engineer the brain

- **Security**
  - Restore and improve urban infrastructure
  - Prevent nuclear terror
  - Secure cyberspace

- **Joy of Living**
  - Enhance virtual reality
  - Advance personalized learning
  - Engineer the tools of scientific discovery
Solving Society’s Energy Challenges

NSF Engineering Research Center for Future Renewable Electric Energy Delivery and Management (FREEDM) Systems

- Center Director: Dr. Iqbal Husain
- “Top 10 Emerging 21st Century Technologies”
  ~MIT Technology Review
- $40 million, 10-year grant from NSF
- Creating the “Internet for Energy” for renewable energy generation and storage
- Over 40 industry partners and catalyst for numerous “clean-tech” companies
  - Unconditional renewal in 2015 through 2018

Next Generation Power Electronics Innovation Institute (PowerAmerica)

- NC State University Lead Institution
- Director: Maj. Gen. Nick Justice
- $140 million grant from U.S. DOE
- Develops advanced manufacturing processes to enable large-scale production of wide bandgap semiconductors
- Comprises university, government and 12 energy sector leaders such as Cree, ABB, Toshiba, Delphi Automotive, John Deere Electronic Solutions
- Spinoff from the FREEDM Systems Center
Transforming US and Global Health Informatics

NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

- Center Director: Dr. Veena Misra
- Potential $40 million ten-year grant from NSF
- Awarded in 2012 and unconditionally renewed in 2015 for another five years
- Developing and employing nano-enabled devices and sensors to create innovative, battery-free, body-powered, and wearable health monitoring systems
- Currently has 33 industry partners

CASL: The Consortium for Advanced Simulation of Light Water Reactors

A DOE Energy Innovation Hub for Modeling & Simulation of Nuclear Reactors

- Renewed for a 2nd 5-years at $121.5 million in 2015
- Mission: Reduce capital & operating costs - Reduce nuclear waste – Assure nuclear safety
- Vision: Create a virtual reactor for predictive simulation of Light Water Reactors

NC State Leaders

Chief Scientist for CASL: Dr. Dave Kropaczek

CASL Education Director: Dr. Mike Doster

Core University Partners
- NC State University (Lead)
- University of Michigan
- MIT

Core National Lab Partners
- Idaho National Laboratory
- Los Alamos National Laboratory
- Oak Ridge National Laboratory
- Sandia National Laboratories

Core Corporate Partners
- Tennessee Valley Authority
- Electric Power Research Institute
- Westinghouse Electric Company
**Consortium for Nonproliferation Enabling Capabilities**

A research and education hub for the development of enabling technologies and technical talent for meeting the grand challenges of nuclear nonproliferation

- 3 National Lab partners: ORNL, LANL and PNNL
- Six University Partners:
  - University of Michigan
  - University of Illinois
  - NC A&T State University
  - Purdue University
  - Georgia Tech
  - Kansas State University

- Five-Year, $25 million, National Nuclear Security Administration grant
- NC State is the lead institution
- Leadership:
  - Dr. Yousry Azmy, Director
  - Dr. Robin Gardner, PI and Chief Scientist
  - Dr. John Mattingly, Co-PI
- 11 NC State faculty and staff in 6 departments from 3 colleges including College of Humanities and Social Sciences and College of Sciences
- Next generation of methods and tools to detect, locate, identify, and characterize Special Nuclear Material (SNM)

**NSA Science of Security Lablet (SoSL)**

- Based out of Computer Science
  - Led by Dr. Laurie Williams and Munindar Singh
  - 14 supported NC State faculty; 18 supported NC State students
  - Multi-disciplinary: 4 NC State colleges and institutes
  - 6 collaborating university partners
- Other NSA SOSL lablets: Carnegie Mellon, University of Illinois Urbana-Champaign, and University of Maryland
- Projected $2.0-$2.5M funding per year per lablet

Critical cyber systems must inspire trust and confidence, comply with applicable security and other policies, predictably protect the integrity of data and resources as well as the privacy of data owners, and perform reliably and safely. Therefore, a scientific basis for the design, analysis and operation of trusted systems is needed.
Centers, Institutes and Laboratories

- Analytical Instrumentation Facility (AIF)
- Center for Additive Manufacturing and Logistics (CAMAL)
- Center for Dielectrics and Piezoelectrics (CDP)
- Center for Educational Informatics (CEI)
- Center for Nuclear Energy Facilities and Structures (CNEFS)
- Center for Transportation and the Environment (CTE)
- Clean Energy Smart Manufacturing Innovation Institute (CESMII)
- Consortium for Advanced Simulation of Light Water Reactors (CASL)
- Consortium for Nonproliferation Enabling Capabilities (CNEC)
- Constructed Facilities Laboratory (CFL)
- The Ergonomics Center of North Carolina (TECNC)
- Institute for Next Generation IT Systems (ITNG)
- Institute for Transportation Research and Education (ITRE)
- Minerals Research Laboratory (MRL)
- Nanofabrication Facility @ NC State (NNF)
- National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL)
- NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)
- NSF Engineering Research Center for Future Renewable Electric Energy Delivery and Management (FREEDM) Systems
- NC Clean Energy Technology Center (NCCETC)
- Nuclear Reactor Program (NRP)
- PowerAmerica
- Research Triangle Nanotechnology Network (RTNN)
- Research Triangle MRSEC on Soft Matter
- Water Resources Research Institute (WRRI)

Entrepreneurship

- Entrepreneurship Garage provides a space and tools and equipment for students to pursue their ideas and develop new products and new companies.
- Albright Entrepreneurship Living and Learning Village on Centennial Campus promotes innovative and collaborative entrepreneurship among students.
- Students in NC State’s Engineering Entrepreneurs program create solutions that have a global impact, including
  - A fingernail polish that can detect drugs in beverages, giving women a new tool to avoid sexual assault that is going to market this year.
  - The world’s first low-cost tuberculosis test that is now being used in rural India.
  - A tool that makes handling sewage safer and more efficient in third world countries that won $350,000 in Gates Foundation funding.
Minority Engineering Programs

- Summer Transition Program (STP)
- Minority Summer Research Program (MSRP)
- SStudents Advancement & Retention Teams (START) Mentoring Program
- E144/E145 (Academic & Professional Development Courses for Freshmen)
- Minority Engineering Student Organizations Advising: (AISES, NSBE and SHPE)
- MEP Overnight Recruitment Stay
- Industry Access to MEP Students

K-12 Outreach

- Reaches >17,000 K-12 students and teachers across the state each year
- Summer camps for elementary through high school located across the state (42 camps in 2015)
- Teacher workshops/Research experience for teachers
- Family Engineering Nights for schools
- Engineering On the Road
- Partnership efforts (Girl Scouts, Marbles Museum, Boys and Girls Club)
- Freshman Engineering Design Day, featuring high school and middle school students
More than two-thirds of the College of Engineering is housed on Centennial Campus.

- EB I: Departments of Chemical and Biomolecular Engineering and Materials Science and Engineering
- EB II: Departments of Computer Science and Electrical and Computer Engineering
- EB III: Departments of Biomedical Engineering and Mechanical and Aerospace Engineering
- Biomanufacturing Training and Education Center (BTEC)
- NSF FREEDM Systems Engineering Research Center
- NSF ASSIST Engineering Research Center

21st Century Infrastructure

- 713 Patent Disclosures
- 416 Patents Filed
- 34 Start Ups, including
  - 410 Medical, Inc.*
  - Novocor Medical Systems
  - Tribofilm Research, Inc.
  - WarpSpec Diagnostics
  - Atmospheric Plasma Solutions
  - Smart Material Solutions, LLC
  - Undercover Colors
  - ImagineOptix
  - Polymer Braille
  - Lumeova
  - Nicotrax
  - Augment Medical, Inc.

* Just launched first product on February 9, 2017
The Campaign for NC State

COE Giving Priorities

- EB Oval
- Endowed Professorships
- Graduate Fellowships
- Undergraduate Scholarships
- Academic Program Enhancement
Engineering Oval Update

• Connect NC bond passage provided $75 million in construction funds
• Legislature appropriated $2 million in planning funds
• The university will provide $17 million
• NC State Engineering Foundation has raised more than $23 million to date
• Plans to raise the remaining $37 million

Cornerstone Society

• Members donate $100,000 or more to Engineering Building Oval
• Donations can be made over 5 years
• Named spaces available
• Donor recognition on permanent display
• Exclusive hard hat tours
• Invitations to special events
• Regular updates on progress of EB Oval
Members donate $50,000 or more toward funding Engineering Building Oval

- Donations can be made over 5 years
- Permanent donor recognition in the building
- Invitations to special events
- Hard hat tours of EB Oval
- Regular updates on progress of EB Oval

Long-Term Goal

“To become and be perceived as the leading public college of engineering in the country and one of the premier colleges of engineering in the world”
Our daily commitment to our students is to ensure that the “E” in Engineering truly stands for *Excitement*.