The Department of Forest Biomaterials at NC State’s College of Natural Resources is home to one of the oldest and most respected paper science and engineering programs in the world and a new cutting-edge program in sustainable materials and technology. We are passionate global leaders in innovative forest biomaterials research, educators of tomorrow’s industry leaders, and creators of professional development training for current professionals. We not only deliver a modern and impactful curriculum to our students — we create sustainable solutions to address the materials and energy resources issues facing society.

Since our founding in 1929, we’ve been known for research and educational excellence, biomass utilization and sustainable biomaterials, and novel and innovative solutions to industry challenges. We serve the public, support the land-grant mission of NC State University, translate and apply research that drives discovery and generates value, advance knowledge through science, and educate and train future leaders.

By the Numbers

- 2,000+ alumni globally, including CEOs, senior executives, and owners of major paper and pulp or wood products companies
- 300+ undergraduate students on average
- 100 percent placement of Paper Science and Engineering undergraduates
- 35+ graduate students in on-campus and distance education curricula on average
- 25 full-time teaching and research faculty
- 12 active adjunct faculty
- 13 full-time staff members
- 1 peer-reviewed online research journal (#1 in its field for publication volume) focused on the science of engineering of lignocellulosic materials, chemicals and new applications
- 1 fully-functioning, reduced scale pilot paper plant

Undergraduate Programs

- B.S. in Paper Science and Engineering
- B.S. in Paper Science and Engineering / B.S. in Chemical Engineering dual degree
- B.S. in Sustainable Materials and Technology

Graduate Programs

- Master of Science in Forest Biomaterials
- Master of Forest Biomaterials online distance program for industry professionals
- Ph.D. in Forest Biomaterials

Wood Products Extension

Our Wood Products Extension program works with North Carolina’s wood products industry to improve markets and increase competitiveness and profitability. We also provide educational programming to consumers to increase their understanding of wood products and proper use. Major program areas include lumber manufacturing, mill improvements for value-added manufacturing, and resilient housing against damage and natural disasters.

Forest Biomaterials is a place where you’ll find passionate people excelling at their profession, exceptional learning and global impacts. We routinely discover and develop products and processes for a better society, advance research in science and engineering, and graduate successful students.
Our History

Our Roots
The “Cradle of Forestry in America” grew out of Biltmore Estate near Asheville, N.C., when George W. Vanderbilt hired Dr. Carl Alwin Schenck to manage the 100,000-acre estate after Frederick Law Olmstead left. During his time, Schenck transformed the land and helped create the Biltmore Forestry School. In 1929, NC State University established a School of Forestry, reflecting the importance of North Carolina’s forests and wood products to the state’s economy. Hands-on instruction, close partnership with industry, and determination to support the state’s economy spurred the growth of forestry-related areas at NC State, including a wood products and paper and pulp department that is now one of the most respected programs in the United States.

A New Department: Wood and Paper
In 1948, a focus on extending expertise in manufacturing was formalized when the Division of Forestry established its first wood utilization program, featuring a wood technology and lumber products merchandising curriculum. At the time, the student body included a large percentage of WWII veterans seeking new career opportunities, so a new pulp technology option was developed with industry leaders and featured courses in wood technology and chemical engineering.

The Expansion Decades
In the 1950s, master’s and doctoral degrees in wood technology became available. A new pulp and paper program was founded jointly by the School of Forestry, Department of Chemical Engineering and Department of Chemistry. It was the first undergraduate training program of its kind ever offered in the South. This firmly established NC State as a national leader in preparing graduates for jobs in related industries. Those ties grew stronger when the Paper and Pulp Foundation was established to provide ongoing support for the Paper Science and Engineering program.

Maintaining An Innovative Curriculum
By the 1960s, training expanded to cover related technology and industry-specific business management practices. Specialists in wood mechanics, wood physics and wood structure arrived as faculty members, many from among industry ranks, establishing our long tradition of cross-pollination between NC State’s faculty and industry laboratories.

A Growing International Reputation
By the end of the 1960s, NC State had the largest collection of tropical wood in the U.S. and was a leader in study, research and instruction involving tropical woods and their uses. We ranked first in the nation for number of undergraduates and advanced degrees conferred in wood science and technology. We expanded our reputation internationally with a visiting scientist program and a special pulp and paper training program that attracted more international students. This began our emphasis on international partnerships and student internships with global companies.

The Environmental Era
We became an early participant in bio-based alternatives research after the 1974 oil crisis generated interest for alternatives to petroleum products. In 1977, a $600,000 grant from the National Science Foundation explored converting wood and related materials into chemical resources, one of the first research projects of its kind. Research on the cellular and atomic level with an electron microscope led to NC State’s emergence as an international leader in biotechnology, including the genetic engineering of new fiber sources for the paper and pulp industry. By the mid-1980s we had the largest undergraduate wood, paper and pulp student enrollment in the U.S.

A New Century Dawns
In 2000, a distance learning Master of Wood and Paper Science for professional scientists and engineers debuted, the first pulp and paper degree of its kind in the world. In 2001, Procter & Gamble selected NC State to receive the largest suite of patents in recycling separation technology ever granted to a university as a result of faculty research in paper recycling.
Looking Ahead

In recognition of evolving research initiatives and industry needs, the Department of Wood and Paper Science was renamed the Department of Forest Biomaterials in 2010. In 2013, we added sustainability classes and renamed the Wood Products degree Sustainable Materials and Technology. The Department continues to lead the drive toward sustainable bioenergy and bioproducts.

Today, our premier teaching program takes an interdisciplinary approach to research, linking biotechnology, nanotechnology and other new sciences with wood science and paper and pulp areas to explore new options in fiber sourcing, recycling methods, innovative uses for materials previously thought to be waste, and improvements in manufacturing and processing methods. Faculty and students examine the practical uses of forest biomass as renewable resources that could form the basis for many products of the future, including biofuels, bioenergy, bioplastics, chemicals, housing materials, composite components and more.

Our Future

With undergraduate and graduate degree programs, short courses for professionals, and testing services for industry, the Department of Forest Biomaterials at NC State University is designed to meet a variety of needs for the pulp, paper and biomaterials industries.

Forest Biomaterials is an integral part of the College of Natural Resources and takes a campus-wide approach to multidisciplinary research and educational activities, exemplified by a dual degree program with the College of Engineering.

From educating entry-level professionals and future leaders to supporting industry research and development experts, we are uniquely equipped to discover and develop products and processes for the advancement of bioeconomy. We educate highly successful students and future leaders, and support ongoing career development opportunities.

Our industry is strong and global. The forest products industry manufactures more than $200 billion in products in the U.S. annually and employs around 900,000 men and women. The pulp, paper and forest products industries meet a payroll of $50 billion annually and are among the top 10 manufacturing sector employers in 47 states. With so many opportunities for growth, companies are exploring more start-up oriented approaches to innovation.

Looking ahead, our industry is experiencing a paradigm shift towards innovation. The Department of Forest Biomaterials is uniquely positioned to support these developments and to promote ecosystem and value-chain thinking. In fact, our faculty represent the value-chain of our industry. We are truly a one-stop shop for bioeconomy and entrepreneurship, and we look forward to partnering with you as a student, researcher or professional.

Marko Hakovirta
Forest Biomaterials
Department Head
For more than 40 years, the Department of Forest Biomaterials has graduated exemplary advanced degree students and enjoyed a close partnership with industry. Our master’s and Ph.D. graduates are in high demand throughout the United States and around the world. Our alumni fill leadership roles in management, research, technical services, marketing, engineering, and academia across a wide variety of sectors involving wood and paper sciences, paper engineering and, most recently, forest biomaterials.

**Graduate Programs**

- **Master of Science in Forest Biomaterials** two-year program focused on research
- **Master of Forest Biomaterials distance program** 100 percent online distance-based master’s program for industry professionals with at least one year of relevant industry experience
- **Ph.D. in Forest Biomaterials** three- to five-year program focused on original research

**The Experience**

Graduate students in Forest Biomaterials learn the theory and applications of chemistry, physics and engineering as it pertains to biomaterial science and engineering. Major areas of activity are concentrated in the bioenergy, biopolymers, wood and paper fields. For most programs, a significant part of the graduate experience is performing original research and defending a thesis or dissertation.
Matt Kollman, a Forest Biomaterials Ph.D. student, is excited to be back at his alma mater delving deeper into the area of biorefining, which is the process of converting biomass, like trees and grasses, into electricity, chemicals, and materials.

His research focus is on lignin, a class of polymers that makes up to 30 percent of biomass. In the current techno-economic models, lignin is treated as a byproduct of the biorefinery process and burned as a fuel. Under this assumption, biorefineries are not economically feasible, meaning lignin must be used to create value-added products. Many barriers exist for lignin to become a viable feedstock in the production of chemicals. The goal of Kollman’s research with Dr. Hasan Jameel is to overcome those barriers.

“As our population grows, sustainable utilization of our natural resources becomes increasingly important,” Kollman said. “Continuing to rely solely on fossil fuels, like oil, to meet the needs of our future population is not a viable solution. For the United States to maintain its security as global demand for petroleum causes international tension, we need to use locally sourced, renewable resources to produce energy, chemicals and materials. Our research is making that a reality.”

Eventually, Kollman would like to take his biorefinery knowledge and gain experience in forming public policy related to science and technology.

Do not conduct your research in a bubble; think about why you are doing a particular experiment, how your work relates to that of another group or college, and never stop asking questions of your advisor, professors and other students.

“Almost all forest biomaterials research relies on the principles of many other disciplines,” he said. “This means that the research applies to and helps scientists and engineers of many backgrounds. Forest Biomaterials research is also very applied, so it appeals to those who want to make a meaningful impact with their research and work.”
Paper Science and Engineering
Our accredited Paper Science and Engineering program prepares undergraduate students to apply the principles of math, physics and chemical engineering to the production of paper, tissue, packaging and other biomaterials. Students learn the theory behind making these products with improved efficiency, decreased environmental impact, and at a lower cost in our $12 million dollar, state-of-the-art laboratories. We are the only college in North America with equipment that can convert any biomass material, such as grasses, cornstalks and wood, into pulp and paper at a pilot scale. Through our First-Year Student Retreat, students receive professional development support for skills like resume and cover letter writing, networking and interviewing. All students graduate with at least one paid internship.

- **100% job placement** within six months of graduation
- **Average starting salary is $72,000**, one of the highest starting salary of all engineering programs at NC State

Sustainable Materials and Technology
A combination of material science, business, applied engineering, environmental studies and technology, helps students develop an in-depth understanding of the environmental, economic and social impacts of renewable materials such as wood, bamboo and agricultural byproducts in our fully accredited program. Students leave prepared to help companies and manufacturing industries make more informed decisions about how to make and design products and processes that are more sustainable. By using state-of-the-art thermographic cameras, acoustic emissions testing systems, routers, 3-D printers, kilns, composites manufacturing equipment and computer-controlled mechanical testing equipment in our multi-million-dollar lab, we help students research the most cutting-edge advancements in product manufacturing.

- **Excellent job placement** in a highly-competitive field after graduation
- **Average starting salary is $50,000**

Companies who hire our graduates include:
- Buckman Chemicals
- Domtar
- Enzymatic Deinking Technologies
- Georgia-Pacific
- Home Depot
- IKEA
- International Paper
- Nestle Purina
- Sonoco Products Company
- Thomasville Furniture
- WestRock

Our Undergraduates
During Manon MacAllister’s summer as a process engineering intern with International Paper in Georgetown, S.C., she not only gained critical hands-on paper mill experience, she enhanced her critical thinking skills. Both of which are essential to Paper Science and Chemical Engineering majors as they progress toward life after graduation.

“This internship exposed me to a lot of firsts,” she said. “First full-time job, first apartment, and first experience in a paper mill. It forced me to test my boundaries every day and pushed me along a steep learning curve—I worked in the pulp mill with a focus in the caustic plant, an area that I knew very little about, so every day was a challenge! But, these challenges helped me become a stronger critical thinker, a more effective leader, and a better engineer every day.”

MacAllister’s passion for solving difficult problems is evident in her work, both in and outside the classroom.

“My attraction to the industry stems from the sheer fact that it’s an industry for innovators,” she said. “This industry is constantly having to adapt because of external pressures; for those who seek a challenging career and a job that will allow them to push their limits, paper engineering is right for them.”

MacAllister believes she wouldn’t have found her calling in the paper industry without the continued support of faculty and staff in the Department of Forest Biomaterials. Without her internship, she wouldn’t be prepared for life after graduation in the “real adult world” full of responsibilities.

“*There is no better way to prepare for the real world than with an internship or co-op. The challenges I face every day in a paper manufacturing facility are helping me become a stronger critical thinker, a more effective leader, and a better engineer.*”

“The faculty are devoted to the success of the students and will go above and beyond to assist you,” she said. “So if you are interested in research or just have a general question, reach out! Do not be afraid to ask for help. There will always be someone there who is willing to answer or direct you to the proper person. The real world is very different than college and there is no better way to prepare for it than by experiencing it in short periods during the summer.”

In her spare time around campus, MacAllister was an Engineering Ambassador, an Engineering Career Fair Volunteer and Publicity Coordinator, a member of the Pulp and Paper Student Advisory Committee, a University Scholar, and a Brother of Alpha Phi Omega service fraternity. She is a dedicated and enthusiastic member of our campus community, and now, industry.
Our faculty represent a variety of expertise and vast industry experience. Experts and pioneers in their field, our faculty regularly pave the way for innovative solutions to industry challenges.

- **Med Byrd** – mechanical, chemical, and non-wood pulping, bleaching, agricultural residue processing
- **Hou-min Chang** – chemistry of lignin, pulping and bleaching processes and pollution abatement in pulp and paper mills
- **Vincent Chiang** – biotechnology, cell wall biochemistry, functional genomics
- **Ronalds Gonzalez** – conversion economics, finance and supply chain, integrated analysis of supply chain, conversion process and economics, and financial analysis
- **Marko Hakovirta** – physics, materials science, sustainable technologies, innovation management and economics, new product commercialization
- **Martin Hubbe** – chemical additives to paper, including colloidal chemistry affecting dewatering, charged nature of cellulosic materials and dry strength development
- **Steve Kelley** – sustainable production of energy and materials from biomass, and the application of novel analytical tools to biomass
- **Adrianna Kirkman** – process design and analysis, mathematical modeling and economics
- **Michael Kocurek** – pulp and paper technology, paper properties, stock prep refining
- **Lucian Lucia** – green chemistry, fiber and polymer science, environmental sciences, materials science, renewable polymers, chemical modification of cellulosics for biomedical applications
- **Marian McCord** – bioengineering, textiles and polymer science, chemistry
- **Phil Mitchell** – value-added wood products and lean manufacturing processes
- **Lokendra Pal** – sustainable materials science and engineering, functional coatings, digital printing, printed electronics, 3D printing, and lean six sigma
- **Joel Pawlak** – engineering multiphase materials, including porous fibrous web structures, foams, natural super-absorbents, enzymatic manipulation of material structure, nano-scale fiber composites, and novel application of rheological phenomenon
- **Perry Peralta** – wood physical properties, wood mechanics, statistical process control, development of novel forest biomaterials through the application of non-woven technologies
- **Ilona Peszlen** – wood anatomy and properties, effects of environment on wood and fiber properties, genetic improvement of wood quality and properties, and utilization of plantation wood
- **Richard Phillips** – cost and financial analysis of pulp/paper and biorefinery operations
- **Daniel Saloni** – process improvement, supply chain, biomass and bioenergy conversion
- **David Tilotta** – housing and analytical chemistry, chemical contamination and decontamination of wood and the development of analytical methodology for the detection of organic and inorganic components in wood
- **Richard Venditti** – processing natural polymers in new products and fuels, fundamentals of separation science in fiber processing, and the environmental life-cycle analysis of products
- **Yuan Yao** – interdisciplinary approaches in industrial ecology, sustainable engineering, and operations research to develop systematic and scientific rigorous methodologies
Dr. Hasan Jameel
As a Jordan Distinguished Professor, Dr. Jameel is researching various new applications to directly benefit commercialization and improve the forest products industry’s efficiency and environmental sustainability. He’s exploring cost-effective methods for upgrading lignin to develop a more profitable biorefinery. The outcome of his research will improve the viability of the forest products industry, which is critical for maintaining a healthy forest ecosystem, preserving rural U.S. jobs and decreasing dependency on nonrenewable resources. Within the last 10 years, Dr. Jameel developed a research program focused on converting biomass to bioenergy and biomaterials. This program received more than $6 million in funding for projects, including five industry-based research consortia. Many patented technologies were developed and considered for implementation in industry as a result of his research.

Dr. Sudipta Dasmohapatra
Dr. Dasmohapatra’s research focuses on application of innovative marketing and socioeconomic models to environmentally sustainable products and resources. Her approaches are based on perception measurement, value-based surveys, social impact assessment, and data-based analysis of marketing systems and processes. Dr. Dasmohapatra’s research interests are on the development and application of innovative statistical and big data models for strategic marketing initiatives in forest products industry, water, land, and forest resource environments, and other environmentally preferable product-markets with the goal of adhering to the economic, environmental and social sustainability principles.

Dr. Dimitris Argyropoulos
Dr. Argyropoulos’ research and teaching focuses on the organic chemistry of wood components. His team develops new chemistry for transforming the carbon in trees into valuable chemicals, materials and energy. They use new methods in organic chemistry, NMR spectroscopy and catalysis to understand the transformation of wood biopolymers during industrial processing. Early in his career, Dr. Argyropoulos’ developed the widely used 31P NMR technique for lignin analysis with the chemistry department at McGill University in Canada. He is a Fellow of the International Academy of Wood Science, a Fellow of the Canadian Institute of Chemistry, and has served as the Finland distinguished professor of chemistry with the University of Helsinki and a distinguished visiting professor with the King Abdul-Aziz University in Saudi Arabia. He also served as Secretary and Chair of the Cellulose Division of the American Chemical Society and serves on the editorial boards of five international journals.

Dr. Sunkyu Park
Dr. Park is an Associate Professor and University Faculty Scholar. His research is focused on the fundamental understanding of lignocellulosic biomass reactivity, such as changes in biomass chemistry and structure and their effects on the conversion process into chemicals and materials. He is particularly interested in hemicellulose chemistry and cellulose crystalline structure for dissolving pulp application. His research also expands process development and engineering simulation. He holds an adjunct professorship in Seoul National University, Korea.
The Department of Forest Biomaterials is a research powerhouse with an ecosystem built for achievement and collaboration. Our dynamic mix of expertise and resources makes us a national leader in forest biomaterials. We're known globally for our original research in:

- Advanced manufacturing
- Novel forest-based biomaterials
- Paper science and processes
- Renewable chemicals and energy
- Business processes and innovation
- Sustainable materials and technology

Partnering for Success
We continue to establish research partnerships with other departments at NC State and outside organizations to build on our foundational knowledge and examine key industry and environmental issues. We also call on NC State’s proprietary strengths in new technologies and frequently work with the NC State Biotechnology team, College of Engineering, as well as other departments in examining uncharted areas related to our fields. NC State’s strength as a leader in nanotechnology and other 21st century sciences contributes to our ability to pioneer new research.

BioResources Journal
BioResources is an internationally recognized open access journal founded by NC State Forest Biomaterials faculty, Drs. Martin Hubbe and Lucian Lucia, which examines the emerging field of biomaterials and their potential uses. Leading research is regularly published in-house by the peer-reviewed, open access online journal.

Leading Entrepreneurs
Our department is actively helping start-up companies and businesses take their big ideas to the next level. Drs. Joel Pawlak and Richard Venditti recruited local entrepreneur Scott Bolin to create a start-up company called Tethis. The group developed a way to make diapers more biodegradable. Instead of lining diapers with the petrochemical-based polymer, Tethis is using advanced manufacturing to make a starch base that is super absorbent. Biomaterials innovation has already passed successful customer trials and is ready to begin production in the United States and Europe.
Spotlight Research Facilities

The Department of Forest Biomaterials enjoys outstanding research facilities, a one-ton, on-campus recycling facility and two major laboratory complexes that emulate state-of-the-art industry conditions in both the wood products and paper science sectors.

**Biltmore Hall** is our main college building with nearly 83,000 square feet of teaching and extension space, including numerous laboratories devoted to wood, forest biomaterials, paper science and engineering.

The **Hodges Wood Products Laboratory** is a 21,000-square-foot facility that contains a wide range of production woodworking equipment, testing machines and instrumentation for investigating the characterization, physical and mechanical properties of wood, forest biomaterials and energy products, including:

> Dry kilns
> CNC routers
> Finishing room
> Four universal and several other testing machines
> Conditioning chambers
> Woodworking equipment
> Hot presses for making plywood, particleboard and fiberboard

The **Robertson Pulp and Paper Laboratory Complex** includes research facilities and equipment, plus a new, three-story lab addition. The Paper and Pulp Testing Laboratory is home to the fully functioning reduced scale Baby Wolfpack pilot paper plant and houses specialized paper testing, recycling and pulping facilities. Our Forest Biomaterials and Bioenergy Laboratories accommodate a variety of research equipment, including an array of chemical analysis laboratories, two high-field NMRs and a multitude of surface characterization tools. The complex mirrors modern industry facilities and allows students and faculty to innovate and test new materials while gaining experience under actual industry conditions.
Our Services

The Department of Forest Biomaterials is committed to more than just research and education. We pioneer the processes for solutions to real-world industry challenges. As part of our land-grant mission, we provide testing and technical services in three key areas of faculty and departmental expertise.

Pulp and Paper Services
Our pulp and paper service equipment is available to tackle any industry technical challenges. Some of our offerings include:

- **Chemical pulping** on a bench or pilot scale
- **Mechanical pulping** on a pilot scale
- **Bleaching** on a bench or pilot scale
- **Fiber recycling** on a bench or pilot scale
- **Paper making** with sheet forming or pilot fourdrinier
- **Paper surface treatment coatings** on a bench or pilot scale
- **Pulp, paper or tissue testing**
- **Pulp processing**, including pulping and stock makedown; screening; refining; centrifugal cleaning; and washing and thickening
- **Analytical services**

Sustainable Materials Services
Assistance ranges from informal talks and tours to detailed analysis of technical and production problems, supplemented with testing of materials and wood utilization techniques. We offer:

- **Conditioning samples** for weathering effects
- **ASTM flooring and mechanical testing**
- **NEMA and ISO High Pressure Decorative Laminate tests**
- **North American Laminate Flooring Association (NALFA) testing** (We are heavily involved with the continuing development of standards for this industry)
- **Woody biomass evaluations and assessments**
- **Product troubleshooting**
- **Lumber kiln drying**, including conventional and high-temperature in a masonry or aluminum kiln
- **Mechanical properties of wood products testing**
- **Wood identification**
- **Wood Machining and Tooling Research Program (WMTRP) tests**, including evaluation on tool designs, materials and finished surface quality (Abrasiveness and the resultant product quality evaluations and experimental determination of acceptable machining parameters are also determined for a variety materials and machining operations)
- **Analytical testing** and analysis from a CNC two-axis optical surface assessment system, video optical microscope, tool material integrity evaluation system, as well as a variety of acoustic emission and vibration analysis equipment
- **Building material and Housing Elements Research Chamber tests**
Analytical Testing Services
Our Forest Biomaterials Analytical Testing Center (FB-ATC) is equipped with items like:

- Thermogravimetric Analyzer
- Dynamic Scanning Calorimeter
- Rheometer
- Dynamic Mechanical Analyzer
- Gas Chromatograph (GC) and Gas Chromatograph/Mass Spectrometer (GC/MS)
- High Performance Liquid Chromatograph (HPLC)
- Fourier Transform Infrared spectrometer (FTIR)
- Ultraviolet-Visible Spectrophotometer (UV/Vis)
- Nuclear Magnetic Resonance spectrometer (NMR)
- Gel Permeation Chromatograph (GPC)
- Ion Chromatograph (IC)

The FB-ATC participates in a variety of bioprocess and analytical projects. Typical tests performed include:

- Thermal analysis of wood, thin films, foams, gels, surfactants, biopolymers
- Rheometer to measure stress and strain
- Dynamic mechanical analysis to measure viscoelastic properties of materials
- Klason lignin analyses on pulps and other samples
- Carbohydrate compositional analyses on pulps and other polysaccharides
- Structural analyses for lignin and carbohydrates using NMR
- Quality control of paper products
- Molecular weight distribution determinations
- Environmental assessments for effluents, air quality and water quality profiles
- Enzyme kinetics analysis
- Assay development and validation services

"The team at NC State was helpful at working with us to get a product we liked. The day we did a paper production, the team called in some paper science and engineering students to help with various parts of the paper making process. They were open to trying some odd ideas! So if you want to try something a bit unusual, try NC State."

—Teri Dankovich, Foliawater
Ready to take your big idea to the next level?

We can make that happen.

NC STATE UNIVERSITY
College of Natural Resources
Department of Forest Biomaterials
2820 Faucette Drive
Biltmore Hall
Raleigh, NC 27695-8010

919.515.5807
contactfb@ncsu.edu