

WAKE FOREST UNIVERSITY DEPARTMENT OF

# ENGINEERING

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# A WELCOME

## FROM THE CHAIR

### Welcome to Wake Forest's Department of Engineering!

We are delighted by your interest in our innovative and collaborative program, and we hope you find this booklet informative as you explore how we are reimagining undergraduate engineering education.



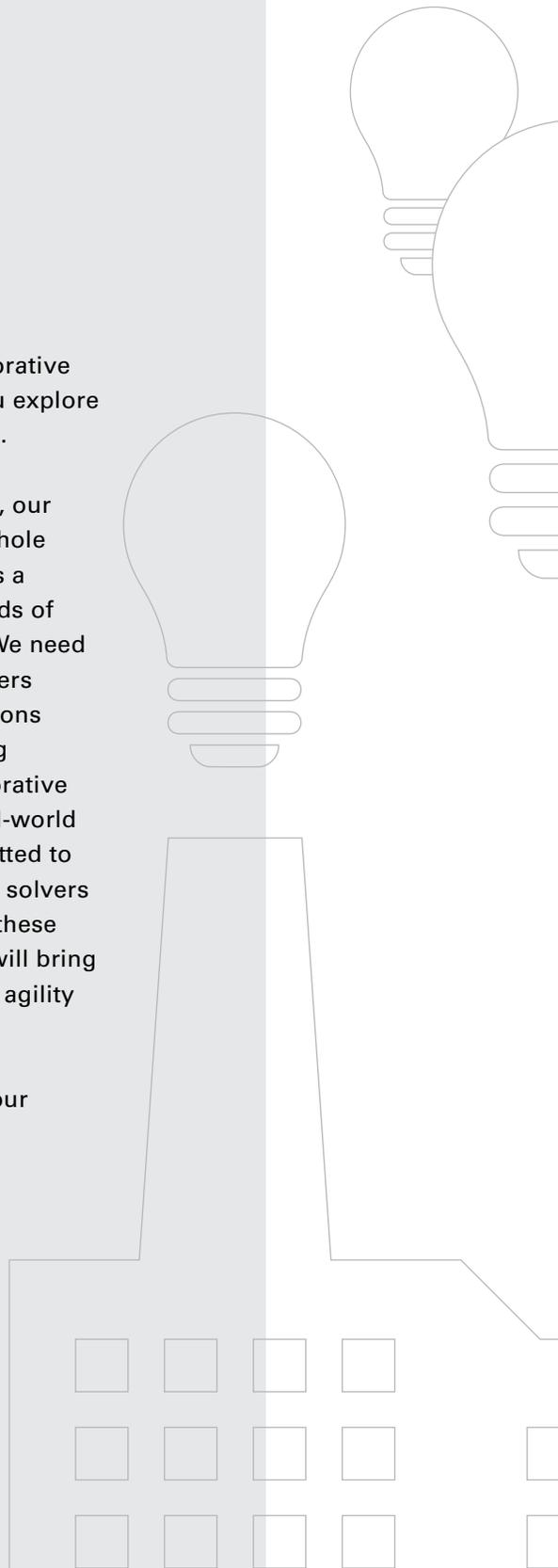
At Wake Forest Engineering, our mission is to educate the whole engineer. The world today is a complex place, and the needs of society are ever-changing. We need a new generation of engineers to deliver sustainable solutions to humanity's most pressing challenges. Through collaborative project-based work and real-world applications, we are committed to producing fearless problem solvers who are prepared to tackle these challenges. Our engineers will bring

their broad perspectives, entrepreneurial mindsets, unyielding agility and virtuous characters to the task.

We invite you to learn more about who we are and join us on our unique journey to educating the next generation of engineers.

Sincerely,

Olga Pierrakos, Ph.D.  
Founding Chair and Professor  
Department of Engineering



## WHY A

# B.S. ENGINEERING

## DEGREE?

This is the number one question we get — as well as the one we are most excited to answer.

Wake Forest is pioneering a new path for engineering education, with the nation's only B.S. program offered by an undergraduate-only department with a curriculum grounded in the liberal arts tradition at a research university.

Our students strive for the best engineering solutions without the constraints of disciplinary silos.

Our focus is in lockstep with the National Academy of Engineering's call for new engineers who lead with skills such as:

Problem solving	Leadership	Curiosity
Vision	Conscience	Scientific insight
Ingenuity	Creativity	Determination

As industry demands more versatility and adaptability, our students are equipped to apply engineering fundamentals across a variety of disciplines and empowered to be agents of change and leaders in innovation. Our B.S. Engineering degree gives students the versatility to face complex problems with a focus on people, community, culture, inclusion and equity.



***I chose Wake Forest Engineering over other schools because most other research universities teach you how to be an engineer, but at Wake Forest, you get to learn what it means to be an engineer. I believe that studying under the Wake Forest Engineering program will not only help me to find this answer, but will also give me the opportunity to be a pioneer among the second set of graduates in the newest engineering department in the country."***

— VICTORIA IYONMANA  
ODUWA ('22)

EDUCATING THE

# WHOLE ENGINEER

We believe it is important for our students to bring their whole and authentic selves to the classroom, their education and all their pursuits. We view engineering as a science, as an art, as innovation and as a humanistic experience. Our students share this philosophy as well as a multitude of interests within and beyond engineering.

We encourage our students to embrace their liberal arts education and make informed decisions about their studies and their personal and professional goals. As educators, our role is to facilitate this growth.

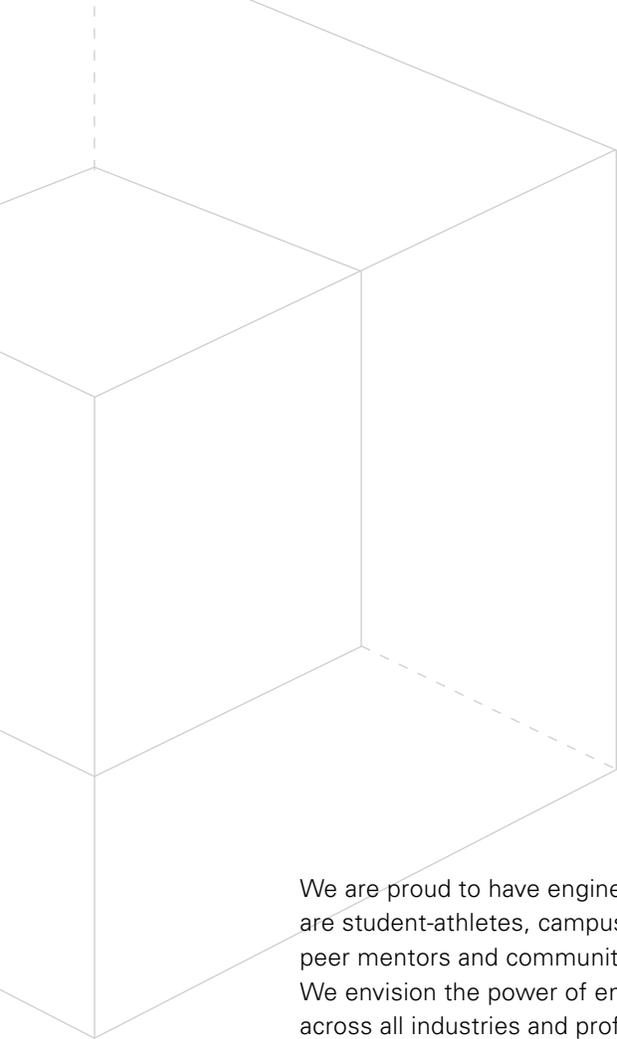
Within engineering, our students show breadth and depth of interests across biomedical, mechanical, environmental, electrical, renewable energy, materials, civil, architectural, data analytics, systems, neuroengineering and aerospace engineering applications. These interests also evolve over time as our majors experience engineering fundamentals, curricular projects, technical electives, internships and undergraduate research experiences. Nearly 60% of engineering majors are pursuing a second major, a minor or even two minors.



***The most rewarding thing for me is seeing myself grow in more ways than I expected."***

— JOHN HOBSON ('21)





We are proud to have engineers who are student-athletes, campus leaders, peer mentors and community catalysts. We envision the power of engineers across all industries and professions, and our classrooms include students on pre-medical, pre-business and pre-law tracks. Such disciplinary versatility is not only good for our students, but also essential in the competitiveness of our workforce. We educate our students for a lifetime of opportunities — not just their first job.

As a program, we celebrate our values of:

- |             |            |
|-------------|------------|
| Empowerment | Compassion |
| Integrity   | Growth     |
| Inclusion   | Joy        |

These values inform and influence every aspect of who we are, what we do and how we do it — from our classroom environment to our undergraduate program to our expectations for how we treat each other. Embracing our values is central to delivering our B.S. Engineering curriculum and the culture we have cultivated with our students.





CUTTING-EDGE YET

# CUSTOMIZABLE

## CURRICULUM

Grounded in a culture and curriculum that value the liberal arts and positive societal change, our B.S. Engineering degree offers students an exemplary academic experience. Rather than having first-year students commit to a particular discipline before they've had a chance to explore a range of interests, our curriculum strikes a unique balance between teaching engineering fundamentals and providing customizable course offerings.

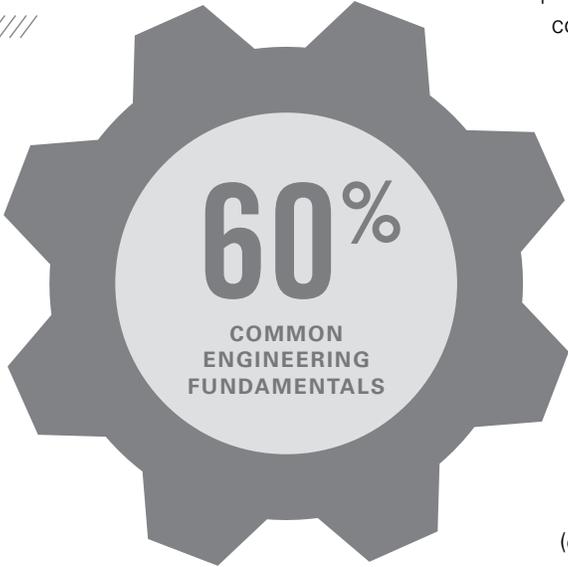
The engineering major requires a minimum of 75 course hours — 30 for basic math and science and 45 for engineering (requirements and electives, in both cases).

Our engineering majors typically take two, four-credit required core courses per year (one each semester). Our majors tailor their remaining 40% of the curriculum to their interests through study abroad, technical electives, research and special projects.

All of our classes feature labs integrated within the traditional lecture setting as well as a project-based curriculum that emphasizes real-world problem-solving, creative design and community partnerships.

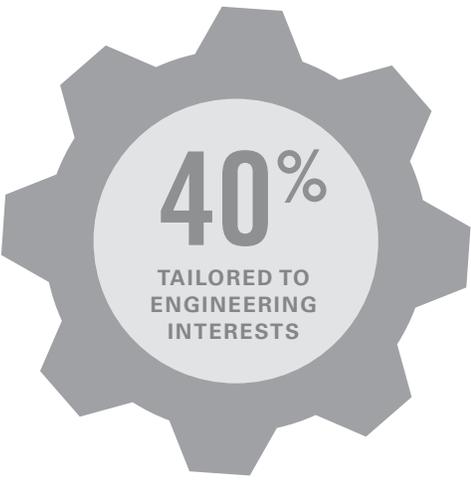
It is a graduation requirement that all majors take the Fundamentals of Engineering Exam (a standardized national exam that is a required precursor in the licensure process of becoming a Professional Engineer).

The engineering minor requires at least 16 hours in engineering, including EGR 111 and EGR 112, as well as PHY 113 and MST 111.



60%

COMMON  
ENGINEERING  
FUNDAMENTALS



40%

TAILORED TO  
ENGINEERING  
INTERESTS

# CURRICULUM OVERVIEW

**First year:** In Introduction to Engineering Thinking and Practice (EGR 111) and Introduction to Engineering Measurement and Analysis (EGR 112), our students learn what it means to be an engineer. Through group projects spanning applications including biomedical engineering, electrical engineering, materials and mechanics, and environmental engineering, students get hands-on experience with sensors, software, 3D printing, physical prototyping, microscopy and more! Our engineers also complete an individual development plan supported by faculty mentors to ensure their personal and professional goals are aligned. Our partnerships in these courses mean students are not only exposed to engineering fundamentals but also learn the historical, cultural and professional contexts of what it means to be an engineer.

**Sophomore year:** In Materials and Mechanics (EGR 211) and Transport Phenomena (EGR 212), our students immerse themselves in the engineering fundamentals in an integrated way and via lab-based experiences and real-world complex engineering systems. Students approach problem-solving from an interdisciplinary lens, applying fundamentals across mechanical, electrical, energy, thermal-fluids and dynamic systems. These hands-on lab-based courses equip students with core foundational knowledge toward the Fundamentals of Engineering (FE) Exam.

**Junior year:** In Control Systems and Instrumentation (EGR 311) and Computational Modeling in Engineering (EGR 312), we introduce advanced systems modeling both physically and computationally. These courses incorporate collaborative learning through group problem-solving and projects. In

addition, with Capstone Design I (EGR 313) in their spring semester, students focus on how they will apply their knowledge to authentic projects and further prepare themselves for the FE exam. Most students will begin to take engineering technical electives to dive deeper into a specific area of engineering or continue to broaden their knowledge with a variety of engineering applications.

**Senior year:** Our students are uniquely prepared to tackle the real-world, multi-disciplinary engineering problems presented in their culminating Capstone Design Projects. In Capstone Design II (EGR 314) and III (EGR 315), project teams of three to five seniors design and build innovative solutions that meet client, user and stakeholder needs, with a focus on how their work positively impacts the human experience in the spirit of Wake Forest's *Pro Humanitate* motto. Capstone Design Projects require students — under the guidance of faculty advisors and industry mentors — to think entrepreneurially, creatively, critically and ethically to develop functional prototypes not yet imagined. In addition, our students complete the remaining of their required engineering technical electives.

*Please see the Academic Bulletin for more information.*



# AND INTERNSHIPS INDUSTRY EXPERIENCE

While our program is relatively new, Wake Forest students have quickly built a reputation as aspiring engineers employers seek to hire.

We work closely with Wake Forest's nationally recognized Office of Personal and Career Development starting in the first semester. We begin preparing our engineers for internship-, work- and life-readiness from their early days on campus.

Just as our project-based curriculum emphasizes real-world collaboration, we dedicate class time to creating individual development plans, refining resumes and practicing interviews so our students are continually translating what they are learning into what they will be doing. More than half of our young cohort has had an internship already as a result of these intentional and sustained efforts.

After all, our students are not just learning the skills they need for their first jobs — they are laying the foundation for their entire careers.



*I received great feedback from my employer last summer, who said I was just as, if not more, prepared than the other intern I worked with who came from a larger, more established engineering program. I am excited to combine all of the knowledge we have built in the last three years into something my group and I can take into our own hands and accomplish."*

— REGAN O'DONNELL ('21),  
BOSTON SCIENTIFIC INTERN,  
2019 AND 2020



## A SAMPLING OF ORGANIZATIONS WHERE OUR STUDENTS HAVE INTERNED OR WORKED:

Amazon ■ American Academy of Science and Technology ■ Boston Scientific ■ Boys & Girls Clubs of America  
■ Cerus Corporation ■ Charter Medical ■ City of Winston-Salem ■ Cognitect ■ Ernst & Young ■ General Electric  
Renewable Energy ■ Genomic Health ■ Johnson & Johnson ■ Katalyst Surgical ■ Livongo Health ■ Molecular Energy  
Storage ■ Mythical Games ■ National Society of Black Engineers ■ Nissan Vegusa Guanojuato ■ Parkdale Mills  
■ PRA Health Sciences ■ Red Ventures ■ San Francisco Public Utilities Commission ■ Seismological Society of America  
■ Select Engineering ■ STV ■ U.S. Naval Academy ■ Wake Forest Institute for Regenerative Medicine ■ Wake Forest School  
of Medicine Center for Injury Biomechanics ■ Wake Forest School of Medicine Dept. of Biomedical Engineering ■ WestRock



# UNDERGRADUATE RESEARCH

More than

# 50%

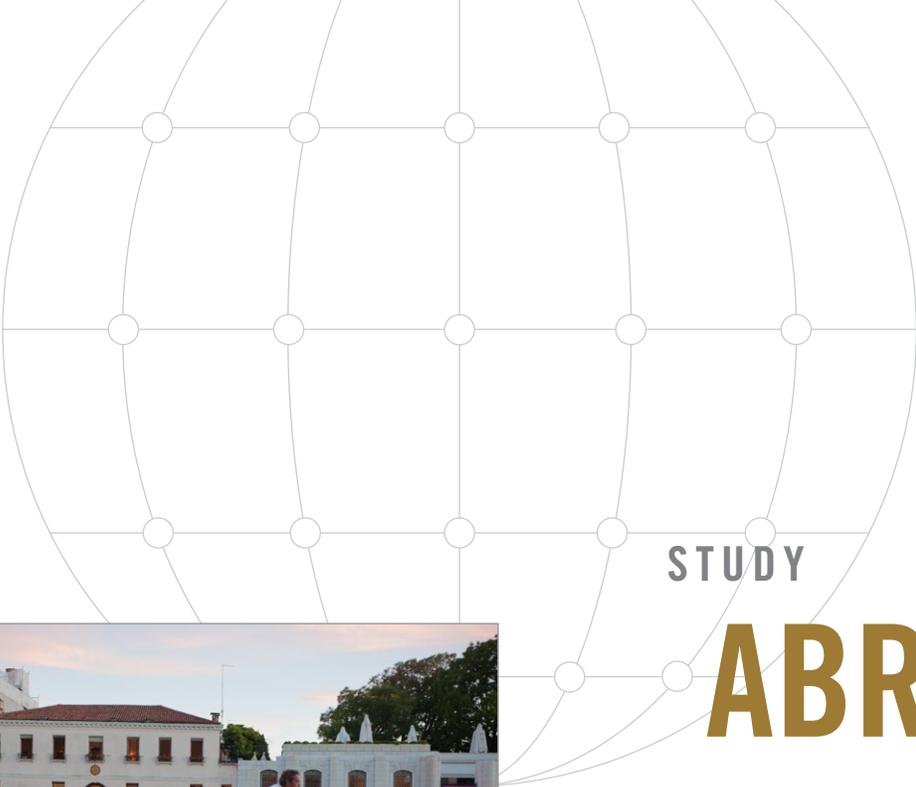
of our students  
have participated in  
undergraduate research.

From solid oxide fuel cells to autonomous vehicles to prosthetic heart valves to renewable energy systems to climate modeling, students have the opportunity to work closely with faculty representing 12 engineering disciplines. Our engineers also have participated in undergraduate research across diverse engineering applications with faculty at the Wake Forest School of Medicine and the Wake Forest Institute for Regenerative Medicine. Additionally, they have partnered with faculty through the Wake Forest Undergraduate Research and Creative Activities Center (URECA) and Research Experiences for Undergraduates, which is funded by the National Science Foundation.



*I worked with Dr. Luthy to design and program a system of autonomous quadcopters to take atmospheric measurements for controlled burns in the local areas of Winston-Salem. It was fun and exciting as I was able to work with my peers to build drones from scratch and implement the skills that I learned from engineering classes. We also worked with Dr. Maxwell Messinger, director of the Unmanned Systems Lab and president of his own company, Linn Aerospace, to program these drones to fly autonomously and collect data! This research project helped me explore the creative side of myself and kickstart an ongoing project for the Wake Forest Engineering Department."*

— ETHAN COOLEY ('21)



STUDY

# ABROAD



Wake Forest offers more than 400 semester, summer and yearlong study abroad programs in 200 cities in more than 70 countries worldwide. The majority of our aspiring engineers have taken advantage of these incredible opportunities. We recommend students who wish to study away do so during their sophomore year (fall or spring), junior year (fall only) or summers (first two years).



“

*I studied abroad in the second semester of my sophomore year at Wake Forest's Casa Artom in Venice, Italy. I chose to pick a program to fulfill some of my divisional requirements. It was an amazing experience! I applied to the program during the fall of my freshman year, so I had it planned out early and it definitely worked to my benefit.”*

— MEREDITH VAUGHN ('21)



# MEET OUR STUDENTS

**40%**

OF STUDENTS ARE

**WOMEN**

(vs. 17% NATIONALLY)



STUDENTS CALL

**20+** AND **10+**

STATES

COUNTRIES



**20%**

OF STUDENTS  
ARE

MEMBERS OF

**UNDERREPRESENTED  
GROUPS**

(vs. 5% NATIONALLY)



**MAX ALBUM ('21)**  
ROCHESTER, NY

- Environmental science minor
- Environmental and renewable energy interests
- Office of Sustainability intern
- Coral ecosystem undergraduate research
- Alpha Epsilon Pi
- Club baseball
- Rock climbing

**LUCY VAUGHN ('21)**  
SAN FRANCISCO, CA

- Chemistry minor
- Wake Forest Institute for Regenerative Medicine biomedical research assistant
- Amgen Scholar
- Cerus intern
- Sydney study abroad
- Kappa Kappa Gamma



**CHLOE BEATTY ('21)**  
WINSTON-SALEM, NC

- Studio art double major
- Civil engineering interests
- City of Winston-Salem engineering intern
- Dance team
- Humane Society volunteer



**NICK RUCINSKI ('21)**  
RALEIGH, NC

- German minor
- Structural engineering interests
- Medical research assistant
- Sports podcaster
- Copenhagen study abroad
- Eagle Scout



# MEET OUR FACULTY

Our faculty represent more than a dozen disciplines and conduct research or practice in areas that transcend engineering boundaries.



**Olga Pierrakos**  
**CHAIR & PROFESSOR**  
Mechanics/Biomedical



**Courtney Di Vittorio**  
**ASSISTANT PROFESSOR**  
Civil/Environmental



**Michael Gross**  
**ASSOCIATE PROFESSOR**  
Chemical/Materials



**Erin Henslee**  
**ASSISTANT PROFESSOR**  
Biomedical



**Melissa Kenny**  
**ASSISTANT TEACHING  
PROFESSOR**  
Biological



**Lauren E. L. Lowman**  
**ASSISTANT PROFESSOR**  
Civil/Environmental



**Kyle Luthy**  
**ASSISTANT PROFESSOR**  
Computer/Electrical/  
Computer Science



**Nick Lutzweiler**  
**VISITING PROFESSOR OF  
PRACTICE, PE**  
Structural



**Saami K. Yazdani**  
**ASSOCIATE PROFESSOR**  
Mechanics/Biomedical



**Kyana Young**  
**ASSISTANT PROFESSOR**  
Civil/Environmental



**Q: Where is the Department of Engineering located?**

**A:** The Department of Engineering is one of the anchor programs at Wake Downtown, the University's STEM-centric campus at the Innovation Quarter. Our address is 455 Vine Street, Winston-Salem, NC 27101.

**Q: How can I get to Wake Downtown?**

**A:** Shuttle buses run from Benson Center on the Reynolda Campus (main campus) to Wake Downtown and back every 15 minutes. They leave both locations every 10, 25, 40 and 55 minutes past the hour.

**Q: When can I start taking engineering courses?**

**A:** Students should begin taking engineering courses their first year (EGR 111 and/or 112).

**Q: Which courses should I register for in my first semester?**

**A:** EGR 111 or EGR 112, MST 111, CHM 111/111L. You could also register for PHY 113/113L in the first semester and take CHM111/111L in the spring.

**Q: When can I declare engineering as a major?**

**A:** You would declare your major during the spring semester of your sophomore year or when you have completed a minimum of 40 hours at Wake Forest.

**Q: What kind of academic advising is available to engineering students?**

**A:** Advising involves two aspects — academic and career development. Dr. Swati Basu serves as the academic advisor for engineering students. Once a student declares engineering as their major, an engineering faculty advisor is also assigned to support academic and career advising.

**Q: Can I use AP credit towards the 30 hours of math and science?**

**A:** Yes. AP credit hours can go toward the 30 hours of basic math and basic science, provided the AP credit was allowed to be transferred to Wake Forest by the department the particular course was offered in.

**Q: Is the program ABET-accredited?**

**A:** The curriculum has been designed to satisfy the requirements necessary for ABET accreditation. However, an engineering program cannot apply for ABET accreditation until after the program has graduated its first class. We expect to apply for ABET accreditation in the year following the graduation of our inaugural class in May 2021. Any program that earns ABET accreditation has the accreditation applied retroactively to the previous year's class, i.e., to the Class of 2021.

*If you have additional questions, please email us at [engineering@wfu.edu](mailto:engineering@wfu.edu) and we will gladly connect you with one of our faculty members or student ambassadors.*



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**DEPARTMENT OF ENGINEERING**

[engineering.wfu.edu](http://engineering.wfu.edu)