# **College** of Science, Engineering and Technology



### **Engineering Programs**

FIND YOUR PURPOSE

GRAND CANYON



PRIVATE. CHRISTIAN. AFFORDABLE.

# BRING LOPES toLife

Download the GCU Virtual Tour application on your smartphone by either searching your phone's app store or scanning the QR code below:



While the application is running, point your phone at designated GCU virtual triggers.



## >>> AUGMENTED REALITY

This brochure contains augmented reality, an interactive experience in which real-world objects are enhanced by technology. Look for the trigger symbol on the images, as this symbol identifies where augmented reality is used. Follow the instructions and prepare to be amazed as these sections come to life on your phone!

#### Try it out!

Scan the trigger icon below and throughout the brochure to watch Lopes leap off the page!



## ABOUT GRAND CANYON UNIVERSITY

Grand Canyon University is Arizona's premier, private Christian university. We help students find their purpose by offering next-generation education that includes over 225 academic programs and over 175 online programs across nine distinct colleges. Approximately 20,500\* ground students learn on our vibrant campus in the heart of Phoenix and over 81,000 online students join our innovative and collaborative virtual learning community.

Spanning 250+ acres, GCU's campus continues to grow with new residence halls, academic buildings, popular eateries, student support resources and amenities, as well as state-of-the-art athletic facilities like the GCU Stadium, the Canyon Activity Complex and more. GCU offers generous scholarship opportunities to make a private education affordable and invests in revitalizing the community with a commitment to making a difference. \*Fall 2019

#### *#6 Best College Dorms in America #19 Best College Campus in America*

Niche.com - 2020 Best Colleges

## Christian Worldview

Built upon a biblically rooted mission, GCU believes quality education and faith can coexist in the 21st century. We integrate aspects of our distinctive Christian worldview into everything we do, and we incorporate Christian principles in the classroom to encourage students to shape their own perspectives. A values-based curriculum further helps students cultivate morality, ethics and compassion within their careers and lives.

GCU students are not required to be Christians. Our approach is missional in nature, characterized by a welcoming spirit and loving service to all from different walks of life. Our students experience the Christian faith, the mission of God and the idea of living for the good of others in a safe and supportive space. We encourage everyone to grow spiritually and live with intention while responding to their call to purpose. 

### **TEN GCU ENTERPRISES:**

The GCU Golf Course, Lope House Restaurant and Pro Shop, GCU Hotel, Canyon 49 Grill, Grand Canyon Beverage Co. (GCBC), Canyon Pizza Co., GCU Ad Agency, Canyon Promotions and Lope Shops.

\*Average tuition after scholarships is approximately \$8,600. Scholarships may be awarded based on 6th semester transcripts. At the time in which final, official transcripts are received, GCU reserves the right to resolud or modify the scholarship if it is determined that eligibility was not achieved. GCU reserves the right to decline scholarship awards for any reason. If a student does not meet the minimum renewal criteria, their scholarship will be forfeited. GCU reserves the right to take and to change scholarship awards at any time without notice. If a student does not meet the minimum renewal criteria, their scholarship will be forfeited. Prices based on 2019-20 rate and are subject to change.



Student success and well-being are top priorities at GCU. We go above and beyond to help our students prepare for their career, as well as have a happy and healthy GCU experience. A wide range of complimentary resources are available around campus to support our Lopes, from academic assistance to student wellness.



As part of our commitment to affordability, we offer fast-track options for students in many programs to accelerate their educational path toward graduation and enter their career sooner. By graduating in less than four years\*, students pay less tuition and have overall less college expenses. Plus, it empowers them to be more proactive with internship and job opportunities.



GCU helps make a private college education affordable and accessible by offering generous scholarships. On average, a student pays approximately \$8,600\* after GCU-funded scholarships for the academic year, which reduces tuition by about half.



We go to great measures to provide students with a safe and comfortable environment to live, learn and enjoy. The various clubs, organizations and ways to get involved as well as supportive resources, such as the GCU Learning Lounge<sup>®</sup>, the Academic and Career Excellence (ACE) Center and peer and professional counseling, help turn our campus into a second home.





GCU also serves as the parent organization of multiple enterprises—the GCU Golf Course, GCU Hotel, Canyon 49 Grill, Grand Canyon Beverage Company, Canyon Promotions and the GCU Ad Agency. Students have a unique opportunity to get involved in these enterprises, participating in the transformative impact that an effective relationship between business and community creates. These enterprises provide students with hands-on learning environments, create real workplace experiences and inspire students to use business as a means for good in their communities.

Many colleges and universities have implemented additional measures of evaluation before permitting upperclassmen to complete their major course of study. Secondary acceptance requires an additional application, a second review of previously submitted materials and/or a minimum GPA requirement. These secondary measures can potentially delay graduation and cause students to incur greater expense. At GCU, most incoming students are accepted into their program of study without a secondary review, with the exception of our nursing and athletic training programs, which require secondary acceptance due to clinical restrictions.

## **>>>>**

## WHAT MAKES THE ENGINEERING PROGRAMS AT GCU DIFFERENT?

#### INTERDISCIPLINARY APPROACH TO ENGINEERING

At GCU, we take an interdisciplinary approach to engineering by collaborating with students in other majors in an effort to solve problems across disciplines and industries. Students may team up with business majors in an innovation class, for example, to work toward a new idea or product while refining their teamwork, problem solving and communication skills. Additionally, students learn project management principles and professionalism in subsequent courses. Engineering students also help students in other majors by assisting them on projects in the GCU Lopes Labs.

#### INDUSTRY-DRIVEN CURRICULUM

Our engineering programs were created in response to industry demand for resourceful, well-prepared graduates. We incorporate key perspectives of industry leaders into curriculum development to ensure our graduates are ready to excel.

#### HANDS-ON LEARNING

Most engineering lectures and labs are combined into four-credit courses. Instructors lecture for a short amount of time, followed by students directly applying the lesson during that same class period.

#### **NEW INFRASTRUCTURE**

The new 173,447 sq. ft engineering building—with over 30 labs and cuttingedge machines and equipment— accommodates our expanding student population and anticipated growth in our engineering programs.

#### WORK EXPERIENCE

Our goal is for students to start a career when they graduate from GCU. During their senior capstone project, students solve real-world problems. This ensures all students have the opportunity to take ownership of an original project and gain relevant work experience that can be immediately applied in a job.

#### **NEW INFRASTRUCTURE**

The new 173,447 square foot engineering was built to provide students with high-quality labs equipped with cutting edge machines and equipment. These labs accommodate our expanding student population and anticipated growth in our engineering programs.

#### CHRISTIAN-ORIENTED LEARNING

We believe science and Christian faith coexist and we celebrate scientific discoveries as new understandings of God's glorious creations. Our programs emphasize professional and ethical practices essential for engineering through the lens of our Christian worldview.

#### ENTREPRENEURIAL SPIRIT

GCU's vibrant culture of entrepreneurism inspires students of any major to create startup services and/or products. GCU supports entrepreneurial dreams by offering opportunities for groups of students like our oncampus First Tuesday Marketplace, IDEA Club and business competitions. GCU waives their intellectual property rights for students, providing the opportunity for students to keep their designs, either from class or personal, to sell or start a company.



### WILL GCU'S ENGINEERING PROGRAM BE SEEKING SECONDARY ACCREDITATION?

GCU is regionally accredited by the Higher Learning Commission (HLC) and authorized by the Arizona State Board for Private Postsecondary Education (AZPPSE). GCU plans to seek secondary accreditation once eligible. Programmatic accreditation applications can only be submitted after the first graduating class. We designed our program and facilities to be in alignment with accreditation guidelines, including assignments, assessments and learning benchmarks. Three of our programs (mechanical, electrical and biomedical engineering) have received additional accreditation through ABET to signify the program's effectiveness and ability to graduate equipped engineering professionals.

> ABET Engineering Accreditation Commission

#### ARE CURRENT STUDENTS GETTING INTERNSHIPS?

Yes. Multiple students have had engineering internships already after only completing their sophomore year. The college expects a continuous increase in internships over the next academic year.

#### WHEN DID GCU'S ENGINEERING PROGRAM DEBUT?

GCU launched its first three engineering programs (biomedical, mechanical and electrical) in the fall of 2015. The following year, GCU added four additional engineering programs (general engineering, engineering with an emphasis in robotics, mechanical engineering technology and electrical engineering technology). GCU celebrated its first graduates for the biomedical, mechanical and electrical engineering programs in the spring of 2019.

### WHAT IS THE JOB PLACEMENT RATE FOR GCU'S ENGINEERING PROGRAMS?

89% of GCU's engineering students from the class of 2019 were placed into engineering roles within 90 days post-graduation. In this selfreported study, our alumni reported they were able to find positions in the fields they desired to go into.



## **ENGINEERING** PATHWAYS AND EXPERIENCE

Our contemporary College of Science, Engineering and Technology houses dynamic engineering programs that include diverse areas of study such as robotics, electrical engineering technology, biomedical and mechanical engineering.

#### **Project-Based Learning:**

We challenge our students to apply their passion for science and technology by bringing their ideas to reality, making engineering breakthroughs and advancing the technological sphere in order to improve both the world and humanity.

#### **Research and Design Early On:**

Unlike many other universities, students engage in hands-on experiences and have access to high-tech tools and equipment as early as their freshman year. Starting day one, students are encouraged to participate in projects, design products using advanced technologies and build relationships with faculty members who become advisors and mentors. Students are active participants in their training by utilizing equipment recommended by our industry partners right away. Underclassmen students do not have to compete with researchers for access to equipment.

**Christian Integration:** 

Our Christian perspective prepares students for careers marked by service, integrity, ethical decision making and concern for the common good. Students follow their own moral compass while creating and innovating ways to give back and facilitate change. From serving with Habitat for Humanity to rehabbing computers for an underprivileged population, our students have applied their skills to help solve realworld problems.

Successful startups and products have grown out of the creative ideas and collaboration among students in different majors. Students majoring in engineering, marketing, entrepreneurial studies and business have worked together to bring unique ideas to life in the Lopes Lab. Students have already created a wheelchair for a young girl with cerebral palsy, the Storage Together app where people can offer personal space for storage and Lux Longboards are built as an affordable and fun way to commute.

"The engineering students of today are faced with an incredibly challenging and complex world that is hard to navigate. The goal of the Research and Design Program I am leading, (H III Start Shot), is to provide students with a path to technical credibility. This project comes from a desire to get students involved with aerospace research by using their mechanical and electrical engineering abilities; as well as inspire students to pioneer their own initiatives. If students are looking to get into cutting-edge research, and demonstrate their abilities and passions, GCU engineering is a great opportunity. We embrace students from all disciplines who are able to bring their skills to the table and collaborate in an open environment."

- Daniel Hoven **Bachelor of Science in Mechanical Engineering** Leader of H III Star Shot (Hybrid Impulse Improvement Initiative) Research & Design Program

#### **Collaboration Across Disciplines:**



GCU invites students to embark on an educational journey that extends beyond textbook and classroom learning. Joining our ambitious engineering community is an opportunity to truly design, create and apply. Our engineering programs encourage our students to experience the purposeful and lifelong task of leading the scientific and technological revolution, while also serving humanity.

Learn more at gcu.edu/cset



## **IS ENGINEERING** FOR ME?

Students can start exploring their future vocation by simply identifying what they enjoy doing. Ask yourself questions like: "What problems do I like to solve?" or "Do I enjoy applying the sciences toward a realworld application?"

The Academic and Career Excellence (ACE) Center can help students respond to these questions in relation to their future career path and discover what engineering program to pursue. Students will weigh in on their personality traits, skills, abilities, interests and values.

#### **Becoming a Successful Engineer at GCU**

GCU focuses on developing future innovators, creators, inventors and agents of change with a heart for Christ and fellow neighbors. We prepare our engineering graduates to be professionals who can dig deep, analyze issues and solve problems. A fully integrated curriculum means students are not just learning engineering concepts, but they're learning to think like and actually be an engineer. Students are learning more than technical skills they develop and sharpen industry

skills that incorporate values, altruism, business and entrepreneurism. That way, our students graduate with a foundation to perform successfully in different professional capacities.

> Our Career Compass is a free tool that provides individualized personality assessments and possible career paths based on results. Visit gcu.edu/compass to get help in the right direction!







#### **JOHN VARKEY**

I feel that my education did a good job of preparing me and giving me what was needed to obtain a job. I had a professor who made sure we covered more than just what was required for the class. My education was helpful, but it more importantly taught me lessons on how to work with people of different backgrounds, which will lead me to better success. I found that it was important to learn from other students and to learn about other fields so I can create technology with a purpose. Currently pursuing a PhD in Electrical Engineering at University of Notre Dame

#### **GRANT GOODMAN**

In the summer of 2018, alum Grant Goodman dedicated his time to serving the people of Honduras by interning with an inspirational organization, Sonlight Solar. Sonlight Solar is a Christian-based company that works to provide electricity to countries in need. During his time at Sonlight, Grant had the opportunity to lead the installation of three solar panel array systems for three schools in the remote village of Juticalpa.

"It was fun to oversee the people that came from the US, but also the local Hondurans that join in our efforts," Grant recounted. "Dozens of the people from the local area wanted to help in whatever way they could. They helped us mix concrete or held the poles that would sustain the solar panels. We were not just there to serve the people of Juticalpa, but also to work alongside them to improve their community."

During his internship, Grant was excited to see how the engineering concepts he learned in his courses at GCU aided him in solving real-world problems. "GCU challenged me in my abilities physics, basic circuit knowledge and schematics, but also in my critical-thinking skills in addressing a practical situation. It was fulfilling to see how God had equipped me in my program to meet the needs of a community."

"Overall, I will never forget what one of my Honduran teammates told me while we were installing the solar panels: 'The people of Honduras do not need you to feel sorry for them, but to share the love of Christ to them.' At the end of the day, I realized that I was a servant to God was trying to build in both my heart and Juticalpa. I was there to meet some of the people's physical needs, but also their spiritual needs by sharing the Gospel. And to this day, that is the goal of my career."

Grant graduated with a Bachelor of Science in Mechanical Engineering in 2020. He currently works as a field technician at Advanced GPR.





## WHAT IS STUDYING **ENGINEERING** LIKE AT A CHRISTIAN UNIVERSITY?

Our students embark on their educational journey with a divine purpose, while faith serves as the starting point for learning. Our strong devotion to our faith allows us to unite the knowledge of God and universe, as well as deepen understanding to advance faith-science inquiry. Faith is a matter of conscience, which guides our students in shaping complex thoughts, ideas and practice throughout scientific exploration and discovery.

#### **Integration of Faith and Scientific Exploration**

We believe that God reveals Himself to us through His written word, the Holy Bible, His creation and the natural world. Thus, we consider biblical revelation and scientific inquiry as complementary means of understanding our world. Our Christian beliefs provide a moral and ethical guide in our search, leading us to celebrate scientific discoveries as new revelations of God's glorious handiwork are revealed.

## WHAT MAKES STUDYING ENGINEERING FROM A FAITH PERSPECTIVE AT **GCU** UNIQUE?

#### **GCU's Place in the Science Fields**

Our university is proactive about establishing a strong presence in the sciences. Many Christian universities choose to disconnect from exploring scientific principles and applications of the 21st century. GCU intentionally sets ourselves apart in our belief that a faith perspective drives scientific discoveries and breakthroughs. Our culture centers around an understanding that church and faith have relevance in the natural world and scientific era. With a focus on human understanding, students have the opportunity to explore biblical and scientific connections.

#### Praising God—the Ultimate Designer

We believe we are created in the image of God, the supreme creator. The delivery of our Christian education is based on our distinctive philosophy: to cultivate Christian creators and develop the next generation of engineers to make the world a better place. We don't educate and develop engineers, we educate and develop Christians who become engineers.

"GCU has incredible engineering programs because they are surrounded by the Gospel. Students do not need to be Christian, but in our courses, we are being shown that the skills and knowledge we are building are for a higher purpose. We are studying what God has created and using the tools He has given us to further fix problems and improve situations in this world to impact those who need it the most."

- Steven Irving Bachelor of Science in Mechanical Engineering

#### The Love of Christ Compels Us

The pursuit of holistic ministry helps strengthen servant leadership throughout a career. To become career-ready means to carry out one's unique mission under heaven, while serving the advancement of the world and economy. There are two ways that our ethics-focused curriculum enhances learning:

• Service-oriented projects and learning: Students participate in project-based learning that encourages them to explore ways to make an impact locally and globally. Teams can design a project to not only make a difference in Science, Technology, Engineering and Math (STEM) but help others.

For example, as part of the electrical engineering project, "Powering the World," students select a third-world country and medical device. Students develop ways to power that medical device based on the location and climate of the chosen country. How the device can make a difference socially, culturally and spiritually also comes into consideration.

• Dialogue: Students engage in conversations in response to complex questions of ethical decision making in engineering and science. These discussions may center around designing robotic hands, artificial hearts and other artificial body parts. We may have the power, knowledge and capability to make great advancements, but how far should we go? At what point are we no longer the image of God?



#### **TEACHING & RESEARCH PHILOSOPHY**

Our institution is a Doctoral/Professional University (Carnegie Classification) that supports and promotes a wide array of student and faculty research. Aligned with the Boyer model of scholarship, GCU embraces innovative discovery research, the scholarship of teaching and learning, applied scholarly initiatives, and integrative community-based endeavors. Our thriving research community includes independent faculty scholars, emerging doctoral student researchers, and a wide-range of collaborative faculty-student research teams. We balance our support of faculty scholarship with an emphasis on teaching and mentoring student endeavors. This integrated approach to teaching and research reflects our commitment to both student learning and our growing scholarly community. GCU hosts state of the art laboratory and simulation equipment, provides dedicated support for grantfunded and industry-sponsored research, and promotes innovation through a collaborative research environment and industry-friendly intellectual property policies.

#### **RESEARCH & DESIGN PROGRAM PROJECTS**

Students interested in research can join and/or propose a Research and Design Program (RDP) project. These projects help give students the opportunity to pursue research of realworld problems they're passionate about fixing and get the guidance they need from a faculty member. Here are a couple examples of what our students are developing in their Research and Design Programs:

#### **3Derma Projects**

A group of students have begun working on multiple projects in relation to the biotechnology field. For example, research has been completed on the effects of hydrocolloids and essential oils' effects on Staphylococcus Carouses and Streptococcus Mutants. This research was completed in order to show the significant effects this bandage would have on an infected wound. The correct percentages for the gel mixture and essential oils have been discovered too through various testing methods. The design of the bandage has been optimized to become a cost effective and helpful product. Future testing will involve testing of the bandage's effectiveness on rats through the IACUC process as well as refining the prototype for an aesthetically pleasing product.

#### H III Star Shot

This student group is researching the design of hybrid motors to produce cost-effective, reusable and easily manufacturable motors to compete with solid motors. They recently completed manufacturing of a rocket body and will next test the motor. After this, they will launch test vehicles to develop a highpower rocket capable of reaching 75 miles, which will set a new record for amateur rockets. This will enable the launch and recovery of a scientific payload to and from space.

Students involved: Daniel Hoven, Brenden Foster and Sean Fuller







H III Star Shot Research and Design Program

#### INTERNSHIPS AND POST-GRADUATION JOBS

In-classroom learning and hands-on experiences outside of the classroom prepare students for internship and job opportunities with top companies. See where our students interned or accepted jobs!\*

#### Internships:

Karis Petersen - Prime Solutions Group Whitney Rey — Fusion Orthopedics Kylie Shaplin — Benchmark Electronics Micah Decleene — Intel Corporation Madeline Bradshaw — Areojet Rocketdyne Matthew Grega — Northstar Aerospace Grant Good Carlos — Marroquin Daniel Arce – Arizona Department of Transportation John Welch – Nexant Aerospace Nathan Heckendorf – Clearway Energy Group **Post-Graduation Job Opportunities:** Denisse Delos Santos — Salt River Project Cory Cathera — Raytheon Eric Fisher — Parker Aerospace Jacob Krupp — Tovey Engineering Brendan Kaiser — Honeywell: Component Engineer Tayler Holden — Western States Fire Protection Co. Jordan Momentary — Navy's Nuclear Propulsion Officer Candidate Program Christian Clifton — Benchmark Electronics: Mechanical Engineer II Isaiah Slemons — bioSyntagma

David Dina — Northrup Grumman Michael Erisman — Raytheon: Missile Guiding Systems Engineer Maribel Franco — ON Semiconductor \*Self-reported student information



**ERIK YOST** "I would like to glorify the Lord in everything I do. I would like to innovate society forward for the better but take no credit for it. Instead, I hope what I create is a contribution to the Kingdom of God."

Erik is a freshman in GCU's mechanical engineering program from San Jose, California, with a dynamic resume and big dreams. In 2018, Erik and a couple of his high school classmates were working on a project focused on fuel cells and using renewable energy both in space and on earth. After flying their project on the International Space Station, they presented their project at a national STEM conference where NASA representatives asked if they wanted to continue their research in their facilities. For the next couple of years, Erik was able to gain the knowledge and network he will use to start his non-profit.

While interning with NASA, Erik plans to start a non-profit called FactoArms with the mission to "show God's love while benefiting impoverished areas around the world using engineering advancements." Erik was still able to find time to travel on mission trips to countries like Mexico and Liberia to serve the Lord, connect with the community and test his experiment on a small scale.

Now as a student at GCU, Erik is excited to continue the efforts in his non-profit with the support of faculty and peers who challenge him to grow in his faith. As he looks towards completing his bachelor's degree, Erik aspires to pursue higher education in order to become a missionary contributing to global engineering projects. For Erik, his work and his faith are not separate, and he hopes that he will be able to display the love of Christ in every aspect of his life.

## AMES RESEARCH CENTER



#### LUX LONGBOARDS

Lux Longboards was founded by GCU student Weston Smith, who used use the engineering and entrepreneurial skills developed in his program to produce his own line of electric longboards.

"Being at GCU was phenomenal in my professional growth along with my personal growth. As a very active student, there were a plethora of resources that I took advantage of. When I first started my company Lux Longboards, I highly utilized the Lopes Labs. But more recently I utilized the bottom floor of the engineering building to continue developing my longboards. In the machine shops I made rapid prototypes through the use of 3printing, welding, soldering and milling. My business thrived because of the unique ecosystem including faculty, staff and leadership here at GCU."

#### **Weston Smith**

Mechanical Engineering Technology Founder of Lux Longboards

While in the engineering program, Weston utilized the many engineering facilities available to all students in order to develop his longboard designs. Today he and his company operate out of Canyon Venture's, GCU's entrepreneurial space. The company employs five other GCU students who work with Weston to design, produce, market and sell the longboards.

GCU waives intellectual property rights, meaning that students can use the shops and labs to create anything and they'll maintain their ownership over it.

### DISTINCT Program features

GCU's engineering technology program features the following differentiators that many other colleges do not offer:

- GCU engineering laboratories and shops are available exclusively for students to use for their creations, unlike many other universities where equipment is reserved for only researchers. Students take ownership of their designs and can present them to employers showcasing their readiness to dive right into their career.
- ► We support students and introduce them to resources and industry contacts who help bring student ideas and creations to market more quickly. Unlike GCU, many other universities utilized grants to purchase their engineering equipment, which means the products created with that equipment belong to either the grant-funders or the universities. GCU has waived all rights to student intellectual property. Students actually own their own ideas, creations and products. This inspires industry leaders to work with GCU students because they know students have come up with university-supported ideas that are not owned by GCU.
- Faculty\* are available on campus and accessible to students directly. On average, instructors teach four courses each and maintain a minimum of 15 office hours weekly. Faculty members are able to commit to individual student development because they are responsible for ensuring that students learn.

"I really love my professors. They have real-life experience and connections in the biomedical engineering field to help us after we graduate. They are also available to help whenever we need it no matter what time of day it is."

 Gabriela Calhoun, Bachelor of Science in Biomedical Engineering

"Being a faculty member, my favorite moments are the "ah-ha!" moments; when I get to see my students finally understand a concept they have been struggling with, or when they correctly execute a hands-on lab activity. I want to give them exposure to a multitude of different concepts and skills that they will utilize in the industry. Each faculty member strives to go above and beyond the syllabus by not only teaching with the course materials, but also incorporating our previous experience in industry or academic research."

- Dr. Donna Ward, Lead Faculty Member for Engineering with an Emphasis in Robotics Program
- One-on-one interaction with faculty, small classes, project-based learning opportunities and personalized support from the entire GCU community underscore our strong role as a teaching university. In addition to the faculty office hours, the Learning Lounge and Explore More sessions provide one-on-one and group academic assistance services for students who need extra help to tackle challenging coursework and improve their classroom performance.

GCU leadership remains engaged in current industry needs, observes issues in high-demand fields and stays connected to industry experts. GCU has a number of advisory boards whose sole purpose is to steer curriculum development to ensure GCU students gain the most relevant exposure and experience prior to entering the workforce.

"I like that GCU is not only focused on research, but on industry too, because we are learning the skills and knowledge that will give employers the traits and qualities they actually want."

> Joel Conrad, Bachelor of Science in Mechanical Engineering, Graduated Spring 2019

#### Industry-Oriented Curriculum

Our engineering programs foster advanced level learning through curriculum designed via industry input. Course content and real-life projects are developed in collaboration with subject matter experts and representatives from major corporations and small consulting companies. Brand-new machinery and modern equipment supplement our curriculum as well.

GCU also assembled a group of Phoenixarea STEM leaders, along with GCU executives and STEM experts. These advisory board members are selected for their expertise and genuine excitement for student success. Their goal is to align STEM programs with trends and evolving market needs to ensure graduates are workforce-ready.

### **Research Project Opportunities**

We aim to continually increase the amount of research, publishing and presenting conducted by faculty and students. Students have opportunities to participate in research initiatives, such as the Research and Design Program (RDP) in which students work with faculty on research projects. Our Center for Innovation in Research and Teaching (CIRT) provides guidance on research topics, methodologies and avenues for publication and presentation. CIRT also secures and provides grants for priority research projects.

The student experience is tailored to help the entire university community achieve their goals and find success. Faculty and students contribute to the scholarly community through publications and presentations. Faculty and staff are committed to putting students and their needs first.



#### **Research Project Spotlight:** *Dr. Jeffrey La Belle*

The Biomedical Device Design Prototyping (BD2P) lab, led by principal investigator Dr. La Belle, concentrates on empowering undergraduate students to work on innovative research. The La Belle Lab focuses on the development of point of care sensors, wearable devices and innovating biomedical manufacturing. They are also working to develop costeffective, lightweight prosthetic arms that meet the needs of each individual patient. Dr. La Belle strives to create diverse, multidisciplinary teams from across the programs within College of Science, Engineering and Technology in order to provide students with strong research experience.

### **DID YOU KNOW?**

More than 30 labs are available for students to experience hands-on learning using advanced technologies and tools for real-world projects. Unlike many other universities, students can access these labs from day one of their freshman year.

## ON-CAMPUS **STATE-OF-THE-ART** ENGINEERING FACILITIES

GCU built two new buildings dedicated to STEM learning to accommodate quickly evolving STEM fields and the growing number of students studying these disciplines. These buildings serve as innovative learning grounds for engineering students to design, create and test prototypes that serve a real purpose in the world. Ample space features innovative labs and centers where students bring ideas to life.

#### The Lopes Labs

During summer 2019, GCU expanded its makerspace to allow students more space to innovate. The Lopes Labs now includes the GCU workshops, which house a metal machining shop, a manufacturing center and a woodworking shop. Equipment such as CNC plasma cutter, CNC metal lathe, 4-axis machining center (mill), coordinate measurement machine (CMM) and plastic injection molder all serve as hands-on learning tools. And, to further aid students in developing their skillsets, these Lopes Labs feature many small hand tools that can be used to assemble their projects or disassemble other products to learn more about how they operate. The Lopes Labs are available for any GCU student to use in order to benefit from an open environment to innovate and work on projects they are passionate about. Our shop staff works full-time to train students on how to effectively utilize the machinery and abide by OSHA standards.

#### **Dynamics Lab**

Used for statics and dynamics, this lab and equipment helps students apply physical concepts to complex real-world situations. Dynamics is a branch of mechanics concerned with the motion of bodies or any objects under the action of forces. Students use static boards, pulley systems and other tools to visualize these forces. Lab activities enhance a student's ability to mathematically analyze components and systems for mechanical performance.

#### **Transport Phenomena Lab**

Students learn about fluid flow, heat transfer and mass transfer. This may include utilizing a piping system, for example. Students learn how water flows through it, what type of pressure is needed to ensure water flows throughout and how much resistance is in the pipes.

#### Biomaterials and Electrical Materials Lab

This lab contains significant graduate-level equipment in an effort to give our students hands-on experience in preparation for industry or graduate school. There are four stations of biotesters. Our Biomedical Engineering program focuses on medical devices because it is a high job growth area. This lab is where students can test different materials to see if they could be used in a biomedical device. Our Scanning Electron Microscope (SEM) is also utilized by our electrical engineering students in order to chart the purity of a given silicon wafer. Electrical engineering students use this lab to explore electrical materials using scanning electron and atomic force microscopes, as well as learn how these molecular properties impact the material and subsequent product.

"As soon as the shops opened (the Lopes Labs), I got my hands on the equipment. I was involved with GCU's Society of Automotive Engineers chapter that year, where we are fixing up a go-kart. It was really fun because I got to learn how to use the CNC metal lathe, the welding center, the manual metal mill, and other hand tools. From this initial project, I was able to gain the experience I needed to work on more complex projects. I received and accepted a full-time job offer from Southwest Products working on designing industrial pumps; my experience in the GCU shops, as well as a previous internship Nautilus Systems Inc., were vital for me to be offered the job. I have been able to build strong relationships with the shop manager and his staff, as well as other students because of choosing to use such great resources. And because I used the shops early on, it was much easier for me to design and build my senior capstone project, which was a manual wheelchair that a patient can operate with one hand."

 Matthew Furfie, Bachelor of Science in Mechanical Engineering

#### **Computer-Aided Engineering Lab**

Students learn how to design in 3D, lay out drawings and simulate conditions in order to arrive at a potential engineering solution. These active learning tasks include modeling ideas and designs in SOLIDWORKS. Students can then print their designs with a 3D printer to create prototypes. After creating a design, students can convert their 3D design to G-Code, upload the code to the CNC machine in the Machining and Fabrication Center and automatically create their product.

#### **Mechanical Materials Lab**

Students learn how to test, analyze and evaluate different materials under loadbearing, compressing, pulling apart, twisting or bending conditions. This process helps determine material properties for appropriate design selections.

#### **Power & Energy Lab**

The power lab gives students handson learning experiences for power generation and distribution. The lab contains training stations for wind turbines, generators, motors, transformers, transmission lines and SCADA controlled bus-bar technologies, which allow the students to experiment and demonstrate the concepts learned in the Power Systems course.

#### **Bioinstrumentation Lab**

GCU's bioinstrumentation lab includes many clinical devices such as an EKG, EEG, EOG, and a bio-printer. Additionally, students work to develop such devices and compare their work to clinical counterparts. Students engage with imagining devices such as CT & ultrasound scanners in order to gain practical clinical and pre-clinical knowledge and experience.

## REAL-WORLD PREPARATION FOR *CAREER SUCCESS*

Our industry-based programs are characterized by:

- Hands-on training to ensure graduates are well-equipped to contribute as an engineer from day one on the job
- Industry-led curriculum adaptive to the ever-changing field
- Business mindset and entrepreneurial approach: students not only create their own products, but can actually market and sell these products and even launch a business
- Collaborative teamwork: the field of engineering is centered on working in teams, so we utilize teamwork in the classroom to prepare students for that level of collaboration
- Teaching expanded beyond lectures with emphasis on demonstrations and immediate, hands-on application of concepts
- Open classroom dialogue to practice articulating different viewpoints on faith-science relationships

"This past fall (2018) I was able to secure a position with Raytheon for the upcoming summer as an electrical engineer intern in the radar production department. GCU prepared *me for the interview process with teaching* me networking skills as well as how to talk with managers. Forming relationships with engineering faculty such as professor Russell, and Mariette Hahn from GCU's ACE Center, also helped me in my engineering interviews. GCU's engineering program bring tons of engineering companies on campus. Being exposed to engineering companies before my Raytheon interview absolutely helped me being that this will be my first internship. I've had exposure to a lot of equipment that is not necessarily used by undergraduate engineering

- programs, such as the SEM which also impressed a few of the Raytheon employees. GCU gives its students access to tons of realworld problems in order to give them the best chance at success post-graduation."
- Joshua Easley, Bachelor of Science in Electrical Engineering, currently an electrical engineer at Raytheon

#### **Career Services**

The Academic and Career Excellence (ACE) Center serves as a resource for students to refine their resume and cover letter, practice interviewing, network and explore career opportunities. Students learn best practices for career planning and transitioning from academics into purposeful employment. Students also have great connections to internships that help them learn more about what they want to do with their future. The ACE Center works directly with the College of Science, Engineering and Technology to prepare students for networking, meetand-greet and interview opportunities with engineering employers. Students go through a series of workshop preparation activities before connecting with industry professionals.

#### Exposure to Software and Technology Development

In addition to learning math critical to engineering, students also learn to use industry software for solving calculations quickly and effectively, saving time and resources. Students learn to use and apply SOLIDWORKS, Labview and programming language C, which is the most common language and is widely used across different levels of programming and engineering. It's a broad mid-level language, so learning C helps with learning additional languages.

#### **Senior Capstone Projects**

All senior engineering students participate in a year-long course where students are put into multidisciplinary teams to tackle real world problems. During their junior year, students take an engineering project management course where they learn to develop and write out the scope of a project. In order to enable students to work on what they are passionate about, students are able to submit their proposals for the college leadership to review. Then, for their senior year, they are put into teams to implement their projects by managing an assigned budget, deliverables and resources — providing them with a clear picture of what the industry is like. A faculty member is assigned to each team in order to provide feedback and guidance on their work and hold them accountable to meet deadlines. Senior capstone projects are the culmination of the learning experiences in an engineering program. At the end of this year-long course, the senior class showcases their work not only to GCU's college leadership, but also its industry partners.

#### Powered Litter TR

Emergency recovery of injured personnel in geographically challenging regions is a very complicated and dangerous process for both the patient and the rescuers. When a patient cannot walk and needs to be carried, it puts a large amount of physical strain on the rescue workers and a danger of dropping and further injuring the patient. Students in this project had the opportunity to work on designing, testing and verifying a battery-operated device that attaches to a rescue litter's wheel to make it self-propelled, assisting in emergency rescue and recovery.

Team members: Erica Bender, Lain Geisler, Jayden Key and Scott Martin

#### **Devices for Students With Disabilities** In conjunction with nonprofit organization ACCEL

Students with disabilities often need specialized equipment to provide them with equal opportunities. This project allowed students to work with a school for disabled children, teens and young adults to develop innovative seating solutions for students with specific disabilities which can be easily adapted for various students. The project involved the production and delivery of these seating solutions, giving our engineering students experience in each stage of development.

Team members: Peyton Fridlund, Logan Hall, Kylee Laprise and Anna Stair





## ENGINEERING TECHNOLOGY PROGRAMS

Our engineering technology programs focus on the real-world application of engineering principles to understand how things work, how they are made and how they can be improved. Graduates will emerge with hands-on experience and foundational knowledge that enable them to become immediate contributors in the field. Our engineering technology programs have been designed in direct response to the manufacturing community's needs and a lack of engineering technology professionals for the manufacturing sector. Manufacturing is typically the biggest sector where engineering technology graduates work; however, careers are not necessarily tied to this industry.

"The reason that I choose to go to GCU for engineering is because I knew here at GCU I would get one of the most advanced learning experiences around and also able to be connected with the Christian faith. One of my favorite labs that I have been a part of here at GCU is the robotic hand project that we completed as freshmen, from building the hand, to connecting the circuits and programing it to form the "Lopes Up!" sign.

GCU has also been able to strengthen my skills as an aspiring female engineer. I have been given so many leadership opportunities, such as starting and holding a presidential position in the robotics club on campus, to being able to help out with STEM programs for incoming freshmen. GCU has been the best choice that I have made for my future in engineering."

Makayla Jewell, Bachelor of Science in Engineering with an **Emphasis in Robotics** 

#### **Engineering Technology vs. Engineering**

What's the difference?

**Engineering Technology:** More hands-on, applied engineering, do-ers, test designs, review plans, math appropriate to level of responsibility, science, execute ideas into action, creation, learn context of what's being solved, interact with and run technology

Engineering technology graduates will:

- Conduct product testing to meet specifications
- Prepare machinery or equipment layout
- ▶ Plan work flow
- Explain engineering drawings, specifications or other technical information
- ▶ Conduct quantitative failure analyses of operational data
- Document design or operational test results

Engineering: More conceptual, design, create plans, high-level math and science, innovate ideas and technology

## **Engineering Technology Degrees**

#### **BS in Electrical Engineering Technology**

Electrical engineering technology professionals engage in process control, electrical power distribution or instrumentation design. Students learn to use diagnostic devices to adjust, test and repair equipment. Other responsibilities include diagnosing, testing or analyzing electrical systems, reviewing engineering plans, calculating specifications and estimates, managing records and overseeing operation testing equipment.

#### BS in Mechanical Engineering Technology

Mechanical engineering technology professionals work with generation, transmission or use of mechanical or fluid energy. Students learn to plan, produce and assemble new or changed mechanical parts for products, such as industrial machinery or equipment. Other responsibilities include interpreting sketches, designing machines, preparing specifications, providing technical support and inspecting mechanical equipment.

## ENGINEERING DEGREES

#### **BS in Engineering**

Students learn to apply strong business acumen, problem-solving, management skills and an engineering mindset to diverse settings, from startups to corporations. Graduates are highly sought after for managerial and strategic roles across both engineering and nonengineering environments.

Average salary for a project engineer: \$89,620 https://www.bls.gov/oes/2018/may/oes119041.htm#(2)

#### BS in Engineering with an Emphasis in Robotics

Technologically minded students gain the broad foundational skills necessary for various engineering careers and learn to understand the fast-evolving world of robotics. This unique degree in engineering can translate into career opportunities in nuclear engineering, manufacturing, industrial engineering and biotechnology. Graduates will be prepared to design robotic systems, such as automatic and autonomous vehicle control or environmental cleanup.

Average salary for a robotics engineer: \$75,487 https://www.glassdoor.com/Salaries/robotics-engineer-salary-SRCH\_K00,17.htm

#### **BS in Biomedical Engineering**

This program supports students in learning to develop devices and procedures that solve medical and health-related problems (e.g., ultrasound, MRI, pacemakers, prosthetics, diagnostic equipment, etc.). Graduates may pursue a job in professional settings such as therapeutic and diagnostic device companies, lab



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#### **BS in Mechanical Engineering**

Students learn to research, design, develop, build and test mechanical and thermal sensors and devices, including tools, engines and machines. Areas of study include generation and transmission of heat and mechanical power, as well as analysis of the environment for the product. Mechanical engineers may work in architectural and engineering services, manufacturing industries and research and development. This degree has received secondary accreditation through ABET through its ability to prepare students with advanced skills and prepare them for their careers.

Average salary for a mechanical engineer: \$87,370 https://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm

#### **BS in Electrical Engineering**

Students learn to design, develop, test and supervise manufacturing of electrical equipment (e.g., electric motors, radar/navigation systems, communications systems and power generation equipment). This program focuses on developments from microelectronic devices and supercomputers to software and control devices. Engineers may work in aerospace, power and semiconductor industries. This degree has received secondary accreditation through ABET through its ability to prepare students with advanced skills and prepare them for their careers.

Average salary for an electrical engineer: \$99,070 https://www.bls.gov/ooh/architecture-and-engineering/electrical-and-electronics-engineers.htm

## SETTING STUDENTS UP FOR **Success**

GCU goes to great lengths to provide students with extensive resources to support their academic and career success and spiritual growth. Our engineering students have access to these resources and opportunities:

- Engineering-designated career coach and career assessments
- Instructional Assistants (IA) and Explore More sessions for additional support
- Faculty office hours for walk-in academic assistance or scheduled oneon-one appointments
- ► Living and Learning Communities
- Engineering-specific student services counselors
- Purpose plans outlining individual student academic pathways
- ► Fellow Lopes!
- Chapel, The Gathering and Life Groups (Bible studies)
- Team of CSET student success specialists

### BEYOND THE CLASSROOM: Design, Create, Build

ECU/

#### **GCU Engineering Clubs:**

- ► American Society of Mechanical Engineering
- ► Biomedical Engineering Society
- ► Institute of Electrical and Electronics Engineers
- ► GCU Robotics
- ► Engineering Servant Leaders
- Society of Automotive Engineers
- ► Society of Women Engineers
- Society of Automotive Engineering (SAE) Collegiate Chapter with Canyon Motorsports and Aero Design Teams

## **STEM** Living and Learning Community

Incoming freshman may choose to live as part of a Living and Learning Community (LLC) on campus to get the unique benefit of living in close proximity with like-minded STEM students. Technology students can build friendships with classmates and peers in similar majors who share the same interests. This is a great opportunity for freshmen to support one another and experience their first year in college together.

## Benefits of joining this close, tight-knit STEM community include:

- Student connection, networking and collaboration
- Communication about program
- Access to additional programming
- ► Upperclassmen mentors
- ► Field trip opportunities
- ► Exclusive events

"I would encourage every engineering student coming into GCU's programs to get involved outside of the classroom early on. GCU's student-led clubs give students a purpose to learn a variety of equipment because they get to work on practical projects that display their abilities to the industry."

 Cory Cathrea, Bachelor of Science in Electrical Engineering, Graduated Spring 2020, Former GCU Chapter President, Canyon Motorsports and GCU Chapter President, Institute of Electrical and Electronics Engineers. Currently a product analysis engineer at Raytheon.

During the spring of 2019, the Society of Automotive Engineers collegiate chapter at GCU built a scaled-down formula SAE race car. They competed against 80 other universities across the globe in Lincoln, Nebraska in the summer of 2019. Their 2020 competition was unfortunately canceled due to COVID-19 restrictions.



## ENJOY THE COLLEGE **EXPERIENCE!**

We also want our engineering students to have fun! Although challenging, engineering is an open canvas for original creativity and innovation. It's a career for exploration and discovery. Getting involved outside of the classroom with others provides healthy schoollife balance and helps students grow in pursuit of their dreams.

#### **ACADEMIC MINOR DEGREE PROGRAMS**

Our various minor degree programs help traditional students maximize their education and give them a competitive advantage for today's workforce. A minor is earned in conjunction with a major degree and provides specialization within an academic area. Students can use their elective credits toward a minor degree and use it as a graduate school application differentiator. Across all colleges, students learn under the close attention of expert faculty and in classroom environments that cultivate higher ethics based on our Christian worldview.

#### For a full list of minors, visit gcu.edu/minors



GRAND CANON

For more information on various activities, contact Student Engagement at **602-639-7250** or **student.engagement@gcu.edu** 



## ENGINEERING ► *Top 5's*

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- ► Undergraduate Research Projects pg. 18
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- Senior Capstone Projects pg. 21
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## **NEXT**steps:



STEP 2

#### Apply for free at gcu.edu/ApplyNow

Set up your student portal, submit your transcripts and monitor your progress toward acceptance



Once transcripts are evaluated, choose one of our all-expenses paid\* campus visitation programs, to learn more about Lope life



Register early to lock in your scholarships, class schedule and housing preferences

To learn more about Grand Canyon University, undergraduate programs offered on campus, available scholarships and more, contact an admissions counselor. 855-428-7884 gcu.edu/CampusAdmissions

\*Restrictions for travel reimbursement may apply.

Please note, not all GCU programs are available in all states and in all learning modalities. Program availability is contingent on student enrollment. Grand Canyon University is regionally accredited by the Higher Learning Commission 800-621-7440; http://hlcommission.org/ Important policy information is available in the University Policy Handbook at https://www.gcu.edu/academics/academic-policies.php. The information printed in this material is accurate as of DECEMBER 2020. For the most up-to-date information about admission requirements tuition, scholarships and more, visit gcu.edu@2020 Grand Canyon University 20GTR0325