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The Passion

Engineers apply knowledge of mathematics and the natural sciences to utilize the materials and forces of nature for the benefit of humankind. Engineers are creative problem-solvers who enjoy the satisfaction of pointing to tangible evidence of their efforts. The space shuttle, skyscrapers, Indy racing cars, satellite communication systems, and consumer goods such as surround sound entertainment systems, computers, and cellular telephones are all created and designed by skilled and visionary engineers. Students interested in engineering must be inquisitive, interested in understanding how things work, and have a desire to design products that will help people and society. Engineers must also demonstrate a strong aptitude for math and science, excellent communication skills, and a commitment to the highest ethical standards. Gonzaga University students learn to apply the principles of engineering with economy and with concern for the environment and society.

The Program

The School of Engineering and Applied Science (SEAS) at Gonzaga University offers traditional four-year Bachelor of Science degrees in Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Mechanical Engineering and Engineering Management. Gonzaga's degree programs in Civil, Computer, Electrical, and Mechanical Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET), and the other two programs are in the process of seeking accreditation.

- **Civil engineers** are problem-solvers who utilize sophisticated technologies to find solutions to the challenges facing society. A civil engineer plans, designs, and supervises construction of the myriad facilities that are required by modern society. These facilities exist in both the public and private sectors and vary tremendously in scope and size. Examples of civil engineering projects include space satellites and launching structures, offshore drilling platforms, bridges, highways, buildings, transportation systems, water supply and treatment systems, flood control facilities, solid and hazardous waste management, and environmental restoration. Civil engineers have roles in design, management, regulatory enforcement, and policy development.

- **Computer engineers** are responsible for the design of general purpose computers (PC's and mainframes) and of embedded computers that are inside video games, cell phones, CD players, appliances, aircraft, and medical equipment. A computer engineer must understand how things work, how to program software to operate these devices,

how to design hardware that can run the software, and finally, how to use an operating system to make hardware and software function in sync. A computer engineer receives the foundational training required in electrical engineering and in computer science. Knowledge in one or more fields of specialization may be pursued in the senior year.

- **Electrical engineering** traditionally includes specialties in computers, control systems, electrical power, and telecommunications engineering, as well as electro-optics, information theory, signal processing, and image processing. Every time people make phone calls, turn on a light or the TV, or type on a computer, one is using inventions created by electrical engineers. Electrical engineering graduates find employment in many different industries including power utilities, telecommunications, computers, commercial electronics, aerospace, defense, education, government, medicine, and law.

- **Mechanical engineering** is a broad field that encompasses activities varying from biomedical research to the design of rocket engines. Mechanical engineers apply the principles of the physical sciences to the production and use of energy, the design and production of goods and machines for human use, and the creation of equipment and systems for manufacturing. Gonzaga's program emphasizes the thermal sciences and their application to the design and analysis of energy-producing systems. The program makes extensive use of Computer-Aided Design (CAD) and other computer-based applications.

- **Engineering Management** is a program designed to provide students with a broad education and understanding of the practice and concepts of

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engineering, and make them adaptive leaders who are ready to address challenges caused by rapid technological changes. Engineering Management attracts students whose talents and goals are broader than conventional engineering design and analysis, and is especially well-suited to Gonzaga students interested in obtaining engineering, business, and management skills. The program contains a set of common engineering core courses that provide a solid basis in engineering principles, augmented by relevant courses in business and management as they apply to technically-based projects.

- **Computer Science** is the study of software in all of its forms, including the software that controls your web browser, the software that lets you download music and videos, and the software that makes digital music possible. Graduates of computer science programs typically work as software engineers, computer scientists, and computational scientists, though many go on to careers in business and law. Built on a foundation of science, mathematics, intensive programming, and computer architecture, the Computer Science major at Gonzaga offers a broad range of advanced computer science topics such as artificial intelligence, computer graphics, robotics, computer networks, database management systems, cryptography, computer security, and computational linguistics.

The Philosophy

In the Jesuit tradition, Gonzaga University focuses on educating all dimensions of the student's development. In addition to a technical engineering curriculum, engineering students complete courses in English, speech, religious studies, and philosophy. These courses develop strong oral and written communication skills while emphasizing critical thinking and ethics.

In the engineering classroom, students interact with skilled faculty whose primary focus is teaching. Small class-size ensures that students receive personal attention. All classes are taught by professors hired and retained based on teaching excellence and a commitment to the success of their students. Faculty members are always available for academic and professional mentoring.

The School of Engineering and Applied Science enjoys support from both the University and private industry and offers students advanced facilities and lab equipment with the latest technology. Gonzaga students gain valuable research and learning experience. They can study environmental issues, robotics, propulsion and a host of other fields in the engineering labs at the Herak building and the newly completed PACCAR building. The CAD/CAE labs provide a fully-networked computer environment where both hardware and software are constantly updated to better support the engineering needs of students and faculty. All engineering students may use the CAD/CAE labs in support of their coursework projects and research.

High school students interested in studying engineering need to prepare themselves by taking four years of math, including algebra, geometry, trigonometry, and pre-calculus.

Calculus is recommended but not required. In addition, students should take at least three years of science including physics and chemistry. Computer-Aided Drafting courses are also helpful, and writing courses are essential. Transfer students from two-year or four-year colleges should consult the School of Engineering and Applied Science regarding transfer credits.

The Projects

Gonzaga University's Center for Engineering Design and Entrepreneurship (CEDE) organizes, supports, and advises students undertaking design projects defined and funded by sponsors. CEDE projects challenge students to solve real industrial problems with limited resources. Project teams consist of three or four Gonzaga students, a faculty advisor, and a liaison engineer from the sponsoring company. All projects culminate in a formal presentation of results during the annual Engineering Project Day.

Sponsors often implement the student strategies created during this process and use the projects to evaluate students for possible employment. Recent sponsors include Alliance Machine Systems, Avista Corporation, Boeing, Coffman Engineers, Goodrich, Isothermal Systems Research, Kimball Office, LHC2, Pacific Northwest National Laboratories, Structural Design Northwest, Sweitzer Engineering Laboratories, and Washington State Department of Transportation.

Gonzaga is a member of KEEN (Kern Entrepreneurship Education Network) which strives to instill the attributes of the entrepreneurial-minded engineer together with the Jesuit educational values of ethics, leadership, faith, service, and justice. SEAS focuses on promoting character formation, particularly honesty, tenacity, ethics, courage, and citizenship, and encourages students to reflect upon the role of that formation in entrepreneurial engineering. The goal is to develop curriculum that teaches each student different aspects of the entrepreneurial mindset every year of his or her education. Freshmen students are first exposed to engineering design in a cornerstone design class, and this experience builds until their senior level capstone design project.

The Potential

Gonzaga students have traveled as far as Benin, West Africa to install water filtration systems and windmills. They have helped design sustainable buildings for the new Catholic University in Juba, Sudan. Civil engineering students are developing home construction designs that use ecologically responsible materials that local residents of Columbia, South America can afford. Gonzaga computer science students rebuild donated computers for elementary schools in Africa and low-income families in Eastern Washington.

Sophomores majoring in engineering at Gonzaga have an opportunity to study abroad in Florence, Italy. Gonzaga-in-Florence courses are designed to fit into engineering students' existing curricula and requirements. Study abroad allows engineering students to gain insight into the past, present, and future of engineering technologies and an

understanding of engineering practice in different cultures and locations.

Involvement in student organizations within the SEAS is an important part of academic life at GU. Opportunities for engineering students include chapters of the American Society of Civil Engineers (ASCE), the American Society of Mechanical Engineers (ASME), and the Institute of Electrical and Electronic Engineers (IEEE). Additional active groups on campus are the Society of Women Engineers (SWE), the prestigious Tau Beta Pi national honor society, Engineers Without Borders (EWB), Inventor's Club, and the Society of Automotive Engineers (SAE), and Upsilon Pi Epsilon (UPE), an international honor society for computing and information disciplines.

Events and activities sponsored by these clubs include Tau Beta Pi's free tutoring for freshman and sophomore engineering students, the SWE's Big Sister mentoring program, and the ASCE and ASME's participation in national competitions such as the Concrete Canoe Competition. Students also participate in community service projects, such as the ASME Bicycle Repair Project, annually repairing old bikes for underprivileged youth.

A wide variety of career opportunities await graduating engineers, including employment with large corporations, consulting firms, state agencies, federal agencies, and overseas companies. In recent years, engineering majors have been the most sought-after college graduates by companies that recruit on university campuses, and starting salaries for engineers are among the highest offered to all college graduates. An engineering degree is also versatile. Civil, electrical, and mechanical engineering students often cross over into related fields such as aerospace, biomedical, and nuclear engineering.

Gonzaga's SEAS graduates are recruited by numerous companies including:

Attunix
Avista
Bechtel
Boeing
Coffman Engineers
Google
Goodrich Aerospace
HNTB
IBM
Intel
Itron
Itronix
Microsoft
Micron Transportation
NASA
Next IT
NIOSH
Powers Fasteners, Inc.
Robotic Process Systems
U.S. Army Corps of Engineers
Washington State Department of Transportation

SEAS graduates have pursued graduate study at highly recognized institutions such as:

Georgia Tech	Northwestern University
Stanford University	University of Arizona
UC-Berkeley	University of Colorado
University of Minnesota	University of New Mexico
University of North Carolina	University of Texas
University of Washington	Vanderbilt University

The People

Gonzaga's talented and diverse engineering faculty possess vast academic and professional experience. Outside of the classroom, they are respected scholars who obtain grants, advance research, publish articles in national engineering journals, present papers at national engineering conventions, and act as consultants to various private and government agencies.

Faculty Contacts and Specialties

The faculty's main emphasis is always on teaching and advising. Supportive of the Mission and student needs, faculty are highly accessible and enjoy sharing their technical and professional experiences with their advisees and all students.

Khyruddin Ansari, Ph.D., University of Texas-Arlington, Mechanical Engineering; specializes in: offshore structures, and dynamics and vibrations. (ansari@gonzaga.edu)

Abdul Aziz, Ph.D., University of Leeds, Mechanical Engineering; specializes in: heat transfer, robotics, and simulation and optimization. (aziz@gonzaga.edu)

Noel Bormann, Ph.D., P.E., Colorado State University, Civil Engineering; specializes in: hydrology and hydraulics, water resource management, and environmental engineering. (bormann@gonzaga.edu)

Shawn Bowers, Ph.D., M.Sc., OGI School of Science and Engineering, OHSU; specializes in: computer science and engineering, database systems, conceptual modeling, data integration, and scientific workflows.

Grigore Braileanu, Ph.D., Polytechnic Institute Bucharest, Computer and Electrical Engineering; Electrical Engineering; specializes in: linear systems theory, automatic control systems, analog filter design, and digital signal processing. (brailean@gonzaga.edu)

Max Capobianchi, Ph.D., State University of New York, Stony Brook, Mechanical Engineering; specializes in: thermodynamics, mechanical measurements, HVAC, electronic packaging and design. (capobian@gonzaga.edu)

Tailian Chen, Ph.D., University of Florida, Mechanical Engineering; specializes in: micro-nano thermal transport and energy efficiency, energy systems, and heat transfer enhancement. (chent@gonzaga.edu)

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