Aerospace Engineering
It is largely about artifacts that fly – airplanes, rockets, satellites, missiles, etc. It is also about how fluids flow (think about how air flows around a car), about control systems, and about how strong things are (and how to make them strong).

Aerospace engineers develop new technologies for use in aviation, defense systems, and space exploration. They also may specialize in a particular type of aerospace product, such as commercial aircraft, military fighter jets, helicopters, spacecraft, or missiles and rockets.

Biological Systems Engineering
This engineering discipline applies concepts of biology, chemistry and physics, along with engineering science and design principles, to solve problems in biological systems. The biological systems are in a broad range, from natural systems, such as watersheds with a focus on water resources, to built systems, such as bioreactors and bioprocessing facilities; all with sustainable focus.

As the name implies, BSEs work to solve problems using biological systems. These biological systems can be small, controlled microbial systems that produce a product, such as beer, biofuels, or pharmaceuticals. BSEs may work with large biological systems, including streams, wetlands and watersheds, which provide environmental services to society, such as clean water.

Chemical Engineering
This branch of engineering applies physical sciences (physics and chemistry), life sciences (microbiology and biochemistry), together with applied mathematics and economics to produce, transform, transport, and properly use chemicals, materials and energy.

Chemical engineers deal with large scale reactions with factory scale equipment and scale up the processes to make them by the ton, and at a profit. In the field, they may work in a variety of specialties; making plastics and resins; nanomaterials or biological engineering; or developing specific products - the production of energy, electronics, food, clothing, or paper. Chemical engineers may also conduct research in the life sciences, biotechnology, and business services.

Civil Engineering
This is the study of the design and construction of public works, such as dams, bridges and other large infrastructure projects. It is one of the oldest branches of engineering, dating back to when people first started living in permanent settlements and began shaping their environments to suit their needs.

Civil engineers design and supervise construction of major public works projects such as buildings, highways, airports, bridges and dams. Since there are so many different types of projects a civil engineer can undertake, many of them specialize in a type of project or branch of the profession such as transportation engineering, structural engineering or geotechnical engineering.

Computer Engineering
This discipline involves the design of computer systems (hardware and software) and related devices. It uses the techniques and principles of electrical engineering and computer science, but also covers areas such as artificial intelligence (AI), robotics, computer networks, computer architecture and operating systems.

Computer engineers are concerned with the design, development, and implementation of computer technology into a wide range of consumer, industrial, commercial, and military applications. In automobiles design, for example, computers are integrated into many systems, including air conditioning, navigation, audio and video systems, and even tire pressure alert systems.

Computer Science
This is the study of computers and computational systems, dealing mostly with software and software systems; this includes their theory, design, development, and application. Although knowing how to program is essential to this major— it is only one element of the field. Computer scientists design and analyze algorithms to solve programs and study the performance of computer hardware and software.

Computer scientists use technology to solve problems. They write software to make computers do new things or accomplish tasks more efficiently. They create applications for mobile devices, develop websites, and program software. And you can find them everywhere, from big tech firms and government agencies to startups and nonprofits.

Construction Engineering & Management
This discipline deals with the designing, planning, construction, and management of infrastructures such as highways, bridges, airports, railroads, buildings, dams, and utilities. These engineers are unique such that they are a cross between civil engineers and construction managers.

Construction engineering managers are responsible for overseeing the construction of airports, malls, schools, manufacturing facilities, highways, high rise structures, water treatment plants and much more. With their managerial expertise, these engineers will likely oversee and execute not only the technical aspects of construction projects, but also the planning and day-to-day operations that include finances, working with subcontractors, and interacting with clients. Some engineers with broad experience may decide to start their own firms.
## 14 VIRGINIA TECH ENGINEERING MAJORS at a glance

### WHAT IS IT?

#### Electrical Engineering
In this discipline, you will study and apply the physics and mathematics of electricity, electronics, and electromagnetism to both large and small scale systems to process information and transmit energy.

#### Engineering Science and Mechanics
This field of study is for the inquisitive. "What produces motion?" "How can we predict the behavior of materials?" "Can some snakes really fly?" These questions lead to applications in aerospace, civil, mechanical, and chemical engineering, among others.

#### Industrial and Systems Engineering
This discipline uses mathematical modeling and scientific tools to extract meaning from a sea of data to find the key to unlocking a system’s true potential. ISE combines mathematics, statistics, physical and social sciences, problem-solving, designing things, and working with people all in one.

#### Material Science Engineering
This is the study of all materials, from those we see and use everyday such as a glass or a piece of sport equipment to those used in aerospace and medicine. MSE combines engineering, physics and chemistry, and uses them to solve real-world problems in nanotechnology, biotechnology, information technology, energy, manufacturing, and other major engineering fields.

#### Mechanical Engineering
This is a discipline of engineering that applies the principles of physics and materials science for analysis, design, manufacturing, and maintenance of mechanical systems.

#### Mining and Minerals Engineering
This engineering discipline applies science and technology to the extraction of minerals from the earth. Mining engineering is associated with many other disciplines, such as geology, mineral processing and metallurgy, geotechnical engineering and surveying.

#### Ocean Engineering
Ocean engineers study the effects of the ocean on ships, vehicles and other structures. They design dams, levees, canals and complex tide abatement systems. Essentially, ocean engineering is the marine-based branch of civil engineering. It merges classical courses in civil and mechanical engineering with oceanography and naval architecture.

### WHAT DO THEY DO?

#### Electrical Engineers design and build hardware and software for a variety of devices that use electricity, electromagnetics, photonics and quantum phenomena, such as robots, smartphones, lasers, electric power, vehicle control, medical devices and more.

#### Engineering Scientists and Mechanics often work in the research, development, or design areas of engineering, such as biomechanics, nanotechnology, or applied physics. Because of the breadth of their training, these engineers are well prepared to lead national and international interdisciplinary teams in a diverse array of science and engineering endeavors, including the legal profession, medicine, business, politics, and government service.

#### Industrial and Systems Engineers integrate people, materials, information, equipment, and energy to design, implement, and improve systems. They improve processes by making them more efficient, better, and safer.

#### Materials Engineers work with metals, ceramics, and plastics to create new materials. Materials engineers develop, process, and test materials used to create a range of products, from computer chips and aircraft wings to golf clubs and biomedical devices.

#### Mechanical Engineers design power-producing machines, such as electric generators, internal combustion engines, and steam and gas turbines, as well as power-using machines, such as refrigeration and air-conditioning systems.

#### Mining and Geological Engineers design mines to safely and efficiently remove minerals such as coal and metals for use in manufacturing and utilities. Many mining and geological engineers work where mining operations are located, such as mineral mines or sand-and-gravel quarries, in remote areas or near cities and towns. Others work in offices or onsite for oil and gas extraction firms or engineering services firms.

#### Ocean Engineers design, build, operate and maintain ships, offshore structures and a variety of ocean technologies including aircraft carriers, submarines, sailboats, tankers, tugboats, yachts, oil rigs, underwater robots and acoustic sonar.