



# **ACCELERATE**

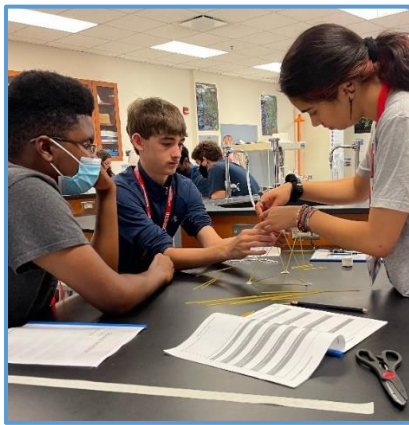
**A GSSM VIRTUAL ENGINEERING PROGRAM**

**2023-2024**

**COURSE CATALOG**

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## About GSSM

The South Carolina Governor's School for Science + Mathematics (GSSM) was established in 1988 under the leadership of Governor Carroll Campbell and Charles W. Coker, then-president of Sonoco Products Company. Since GSSM's opening, the school has provided its students with a unique learning environment that strengthens their ability to think critically, stimulates the joy of learning and fosters the excitement of discovery through hands-on scientific research.

The mission of GSSM is to seek out and advance our state's most talented and motivated students, offering them a transforming education in science, mathematics, and engineering that cultivates joy in learning and builds the confidence to engage as ethical leaders with the world's most significant issues.

### **GSSM Accelerate Program Administration**

Mr. Danny Dorsel, President GSSM

Dr. Michael Newsome, Vice President of Academics

Dr. Zaria O'Bryant, Director of Academic and Outreach Partnerships

Dr. Randy Gibson, Accelerate Manager and Engineering Instructor

Miss Kristal Martinez, Accelerate Coordinator

Mrs. Rana O'Bryant, Accelerate Coordinator

## About GSSM Accelerate and Synchronous Virtual Courses

The mission of GSSM Accelerate is to provide exceptional virtual education using both real-time and blended course-delivery methods that cultivate the interests and talents of motivated students across South Carolina.

To reach high school students beyond those in the residential program, GSSM offers live, virtual engineering education to students in partnership school districts across South Carolina in its Accelerate engineering program and it offers select partner districts Synchronous Virtual Courses (SVC) in mathematics.

Accelerate provides students with an integrated set of courses that deliver high-quality science, engineering, math, and English instruction. Developing valuable skills in critical analysis and professional communication, students who participate in this dual-enrollment program complete courses in the first year of an undergraduate engineering program while in high school. Accelerate gives students opportunities for collaboration, social engagement, and research and design, all of which hinge on the integration of knowledge across multiple disciplines.

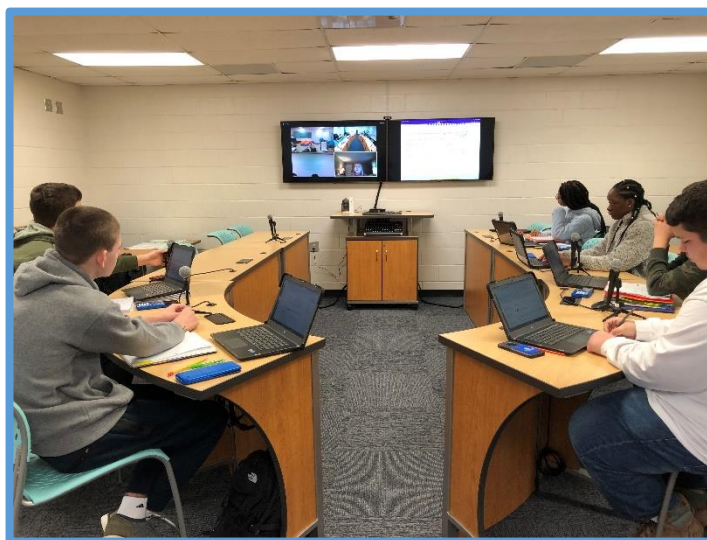
SVC math courses allow students to obtain a foundation in courses such as Honors Algebra II. This helps to increase the pool of students eligible to apply to programs such as the GSSM Accelerate virtual engineering program.

## ***Program Details***

All students enrolling in GSSM Accelerate courses must have been accepted into the Accelerate Gateway through GSSM's application process. Students in the program must take all of the required courses for their grade level and maintain academic excellence throughout the program.

In addition to the virtual courses taken during the academic year, Accelerate students are **required** to participate in a variety of summer learning experiences and a series of mandatory Saturday laboratory experiences. The **mandatory labs** are held on the GSSM campus in Hartsville, SC.

All rising sophomores participate in a one-week residential camp held on the GSSM campus called *Base Camp*. Students have opportunities to bond with their Accelerate peers who attend many different SC high schools, interact with GSSM faculty, and work on engineering projects that build team work, communication, and leadership skills. Rising juniors spend a week on the University of South campus exploring engineering and participating in research projects. GSSM offers several of its summer research and inquiry projects to rising Accelerate seniors and GSSM offers a one-week summer program in partnership with Clemson University on the Clemson campus for the students enrolled in Accelerate.



## ***Technology***

GSSM has developed a live 2-way interactive delivery model that uses Zoom, which is a high-definition video conference platform. Accelerate students from our partner schools across South Carolina simultaneously join live Accelerate classes using classroom videoconferencing systems, laptops, and other internet-connected devices. The students receive instruction, work on group projects, participate in group discussions, and join instructors' office hours for after-class help through Zoom.



The Accelerate virtual engineering program uses Canvas as a course management system. Canvas is designed to support online teaching and learning. All classes are recorded and accessible for review at any time. Instructors provide students with access to recorded classes and other course materials and information through Canvas.

Each Accelerate school is assigned a laptop for use by students enrolled in the program. The laptop can be used at the Accelerate partner school or the student's home to complete classwork, homework, projects, and collaborative assignments. The laptop is formatted to provide students with access to course software and links to instructor-designated websites for required coursework.

### ***The Facilitator***

Key to the success of the Accelerate classroom experience is the facilitator. The facilitator is an adult at the school site who works with the students and the GSSM instructors to ensure a positive learning environment.

Expectations for facilitators include the following:

- Maintaining a safe, productive environment for students in the virtual classroom;
- Serving as the conduit for communication between GSSM and the school;
- Performing certain classroom management functions;
- Administering and proctoring tests and quizzes designed by GSSM instructors;
- Troubleshooting minor technical issues, such as muted volume, unplugged cables, or pointing and zooming the camera;
- Communicating with the GSSM instructors about school closures, schedule changes, or classroom issues that affect student learning;
- Receiving assignments and graded work from GSSM instructors;
- Sending completed assignments to GSSM instructors for grading; and
- Communicating with parents, school counselors, and school administration about student performance.

The facilitator is not required to be a subject-area teacher, though many schools have subject-area teachers participate as facilitator.

## Dual Enrollment Courses

All GSSM Accelerate courses are offered for high school credit, and are either designated as *Honors* or *Dual Enrollment*, which is noted in the course descriptions. Dual enrollment courses allow districts to award high school credit for those courses that are awarded college credit. This is contingent school district policy and upon satisfactory completion of all course requirements.



Courses offered for college credit are certified through a dual enrollment agreement between Coker University and GSSM. Students are enrolled in Coker University as “special students.” College credits are awarded as noted, provided students meet all requirements of both the GSSM Accelerate programs and the appropriate partner college or university. **No college credit shall be awarded for grades below C.**

Completion of the Accelerate program does not guarantee admission into any partner college or university. Students must apply to, and be accepted by, the university and department in which they wish to enroll. Admission of the student and the granting of these credits are solely the province of the college or university partner.





## 2023-2024 Program of Study

	Fall 2023	Spring 2024
<b>Seniors</b>	MAT 231 (Calculus I) EGR 115 (Design and Modeling) PHY 203 + 203L (Physics I and Lab)  Optional English Elective: English 220 (Truth and Consequences)	MAT 232 (Calculus II) Senior Research and Design Projects PHY 204 +204 L (Physics II and Lab)  Optional English Elective: English 215D (Writing in STEM)
<b>Juniors</b>	Honors Calculus (Yr) EGR 102 (Engineering Disciplines and Skills) CHE 101 Chemistry I + L (Chem I and Lab)	Honors Calculus (Yr) EGR 141 (Engineering Programming and Problem Solving) CHE 102 Chemistry II + L (Chem II and Lab)
<b>Sophomores</b>	Honors Algebra III Honors Pre-Engineering Part 1 Honors Chemistry (Yr)	Honors Pre-Calculus Honors Pre-Engineering Part 2 Honors Chemistry (Yr)

**NOTE:** \*ENG 215D and \*ENG220 are optional dual enrollment courses for seniors.

## Course Descriptions

### Engineering

#### *Honors Courses*

#### **Pre-Engineering Part 1 (Honors)**

LBA No. 609924HH

**0.5** HS Credit (units) **Fall**

Pre-Engineering 1 offers students an introduction to engineering, discussing careers and highlighting South Carolina-based industries. Introduces professional, ethical, and societal issues appropriate to engineering. Various forms of technical communication are emphasized. This course is integrated with Pre-calculus.

**Prerequisite:** *Algebra II*

**Pre-Engineering Part 2 (Honors)**

LBA No. 609925HH

**0.5 HS Credit (units) Spring**

Provides a solid foundation of skills to solve engineering problems. Students demonstrate problem-solving techniques with units and dimensions, use modeling techniques and interpret validity of experimental results, learning “thinking like an engineer”. The course is integrated with Pre-calculus.

**Prerequisite:** *Pre-Engineering Part 1*

**Biomedical Engineering (Honors)**

LBA No. 609930HW

**1.0 HS Credit (units)**

This course introduces students to the different sub-specialties of biomedical engineering (BME) including bioelectricity, biomedical instrumentation, biomaterials, and biomechanics. Through hands-on labs, design projects, problem sets, and research article review, students explore and experience the engineering design process, problem solving and troubleshooting in the field of BME. Some questions that might be addressed are: “how are electrical signals from the heart measured outside the body?”, “is there a way to design high heel shoes that don’t hurt women’s feet?”, and “how do engineers design heart valves that only allow blood flow in one direction?”

Note: This is an optional elective and may not be offered every semester if instructor is not available or if minimum enrollment is not met.

**Civil and Environmental Engineering (Honors)**

LBA No. 609932HW

**1.0 HS Credit (units)**

This course introduces students to the study and practice of civil and environmental engineering and to math and science concepts needed to solve problems related to these and other engineering disciplines. Topics include engineering design, statics and strength of materials, hydrology, pollutant fate and transport, and environmental modeling. Activities include small-scale laboratory explorations, design projects inspired by the profession, field measurement, online data acquisition and computational modeling.

Note: This is an optional elective and may not be offered every semester if instructor is not available or if minimum enrollment is not met.

**Electrical Engineering (Honors)**

LBA No. 609933HW

**1.0 HS Credit (units)**

This course is designed to introduce students to the study and practice of electrical engineering. Students explore the wide variety of fields of study in engineering, focusing on topics important to the fields of Electrical, Electronic, Computer, and Systems Engineering. Using activities, design projects, and laboratory modules students learn first-hand how engineers use mathematics and science to solve problems. Topics include circuits, electronics, medical instrumentation, and control systems.

Note: This is an optional elective and may not be offered every semester if instructor is not available or if minimum enrollment is not met.



**Mechanical and Aerospace Engineering (Honors)**

LBA No. 609931HW

**1.0 HS Credit (units)**

This course introduces students to the fields of mechanical and aerospace engineering. It integrates engineering design, core math and science concepts needed to solve problems related to aerospace and mechanical engineering as well as other engineering disciplines. The course includes historical context and addresses the following topics: statics, thermodynamics, fluid dynamics, materials, and mechanics of flight. Through the use of hands-on labs, design projects, problem sets, and demonstrations students learn how engineers use mathematics and science to design efficient and beneficial devices such as automobiles, power plants, airplanes, machinery, and heating/cooling equipment. Students have opportunities to experiment, calculate, compute, design, and build as they explore and solve problems.

Note: This is an optional elective and may not be offered every semester if instructor is not available or if minimum enrollment is not met.

**Senior Research and Design Projects (Honors)**

LBA No.: 609959HW

**1.0 HS Credit (units)**

The Senior Project course is an engineering capstone course designed for students to work through the engineering design process by selecting, researching and developing a new product or process. The product can be either an invention or innovation and the design process should include the development of a prototype. The process should include new methodology of a technical nature. Students continue applying the engineering design process and other skills taught and used in Engineering coursework and summer learning experiences. \*Successful completion of the Accelerate engineering program requires a presentation of the capstone project.

***Dual Enrollment Courses*****EGR 102 Engineering Disciplines and Skills (Dual Enrollment)**

SCDOE No.: 806400EW

**1.0 HS Credit (units)****College credit: 3SH**

Provides solid foundation of skills to solve engineering problems. Students demonstrate problem solving techniques with spreadsheets, dimensions and units; use modeling techniques and interpret validity of experimental results. Students design projects on multi-discipline teams. Introduces professional and societal issues appropriate to engineering. Various forms of technical communication are emphasized.

**Prerequisite:** *Grade of C or better in Honors Pre-Engineering Part 2*

**EGR 115 Engineering Design and Modeling (Dual Enrollment)**

SCDOE No.: 805400EW

**1.0 HS Credit (units)****College credit: 3SH**

This course is an introduction to engineering graphics and machine design. Students use hand sketching and CAD tools to visualize, communicate, rapid prototype, and analyze engineering problems. SOLIDWORKS software is used.

**EGR 141 Programming and Problem Solving (Dual Enrollment)**

SCDOE No.: 805300EW

**1.0** HS Credit (units)**College credit:** 3SH

Students formulate and solve engineering problems using MATLAB; estimate answers for comparison to computed solutions; read, interpret and write programs, instructions and output; iterate, evaluate conditional statements; and debug. Various forms of technical communication are emphasized.

**Prerequisite:** *Grade of C or better in EGR 102***English****ENG 111 English Composition and Rhetoric I (Dual Enrollment)**

SCDOE No. 301500EW

**1.0** HS Credit (units) **Fall****College credit:** 3SH

English 101 is the first half of the required two-course sequence in composition. This course introduces students to the modes of writing, with an emphasis on exposition and argumentation. The course also reviews basic processes of composing: inventing, planning, drafting, and revising. Students will learn how to develop ideas in a clear and logical manner, communicate their ideas coherently to their intended audience, and write in a correct and effective way. In addition to writing several in-class essays and short papers, students will learn the techniques and conventions of academic research. They will participate in at least one session on library and information technology. Fiction and nonfiction readings will provide discussion material and starting points for their writing.

**ENG 112 English Composition and Rhetoric II (Dual Enrollment)**

SCDOE No. 301600EW

**1.0** HS Credit (units) **Spring****College credit:** 3SH

English 102 is the second half of the required two-course sequence in composition. This course advances students' critical reading and writing skills by exploring how writing creates knowledge and shapes meaning; therefore, student writing will involve both print and digital formats. Throughout the semester students will define terms, conduct research, evaluate and synthesize evidence in order to create clearly written, sustained arguments. Readings for each section of ENG 102 will explore a specific and unifying theme or question, and may include readings in fiction and non-fiction. (Previously ENG 102)

**Prerequisite:** *ENG 111*

**\*ENG 215D Writing in STEM (Dual Enrollment)**

SCDOE No. 403500EW

**1.0** HS Credit (units)

**College credit:** 3SH

In this course, students will investigate the circumstances and genres in which STEM professionals write. The course combines readings from scientific, engineering, and mathematics disciplines geared toward general audiences. Such readings will serve as the basis of writing and addressing specific audiences in the disciplines. Students should have completed at least one science course before taking the course or be co-registered for a science course.

**Prerequisites:** *ENG 111 and ENG 112 and completion of or concurrently enrolled in a science course*

\*Note: This is an optional elective and may not be offered if instructor is not available or if minimum enrollment is not met.

**\*ENG 220 Truth and Consequence (Dual Enrollment)**

SCDOE No. 403600EW

**1.0** HS Credit (units)

**College credit:** 3SH

Literature explores the great moral and ethical questions and this course combines historical and contemporary readings to examine the importance of this inquiry. Students will read works of fiction and non-fiction to explore the ways cultures at particular moments in time have determined what is right, good and appropriate. Moreover, students will explore how writers have addressed the ways individuals and groups have resisted or revered cultural constructions of stigmatized, demonized or vilified behaviors in various contexts and situations.

**Prerequisite:** *ENG 111 and 112*

\*Note: This is an optional elective and may not be offered if instructor is not available or if minimum enrollment is not met.

## Mathematics

### *Honors Courses*

**Algebra III (Honors)**

SCDOE No.: 411300HW

**1.0** HS Credit (units) **Fall**

This course is designed to develop knowledge of advanced functions, provide a conceptual understanding of their underlying expressions and give students an opportunity to develop algebraic skills for solving real-world problems. Emphasis is placed on using mathematics as a tool for problem solving, simple mathematical modeling and engineering applications. Topics include data analysis, introduction to functions and their graphs (linear, quadratic, exponential, and logarithmic functions), solutions to equations and inequalities, solutions to systems of equations, recursive equations, matrix algebra, and elementary trigonometry.

**Prerequisite:** *Algebra II*

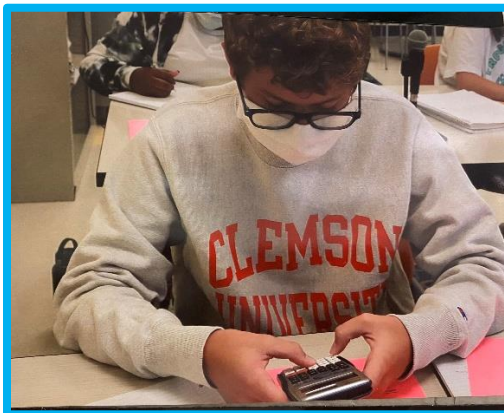
## Precalculus (Honors)

SCDOE No.: 413100HW

### **1.0** HS Credit (units) **Spring**

A survey of material needed to study calculus. Topics include systems of equations, matrix algebra, polynomial functions, rational functions, inverse functions, exponential and logarithmic functions, trigonometric and inverse trigonometric functions.

**Prerequisites:** *Algebra III*



## Calculus I (Honors)

SCDOE No.: 413500HW

### **1.0** HS Credit (units) **Year**

This course introduces students to a variety of topics in preparation for a rigorous study of study college calculus. Topics include functions, limits, derivatives, and integrals. Students will gain an understanding of intermediate value theorem, continuity, differentiation techniques, related rates, optimization, mean value theorem, integration techniques, fundamental theorem of calculus, and volume of solids.

**Prerequisites:** Honors Precalculus

### *Dual Enrollment Courses*

#### **MAT 231 Calculus I (Dual Enrollment)**

SCDOE No.: 413600EW

### **1.0** HS Credit (units)

**College credit:** 4SH

Topics include limits and continuity, the derivative, differentiation of algebraic and trigonometric functions, applications of the derivative, indeterminate forms, basic integration techniques, and the Fundamental Theorem of Calculus.

**Prerequisite:** Honors *Calculus I*

## MAT 232 Calculus II (Dual Enrollment)

SCDOE No.: 413700EW

**1.0** HS Credit (units) **Spring**

**College credit:** 4SH

Topics include applications of integration, advanced integration techniques, improper integrals, parametric equations, polar coordinates, and infinite series.

**Prerequisite:** MAT 231

## Science

### Chemistry

#### *Honors Course*

#### Honors Chemistry I

SCDOE No.: 323100HW

**1.0** HS Credit (units) **Fall/Spring**

This course is an in-depth study of the composition, properties, and interactions of substances. Topics include: atomic structure and nuclear processes; structure and classification of chemical compounds; types, causes and effects of chemical reactions; structure and behavior of the different phases of matter; and the nature and properties of chemical solutions. The standards for scientific inquiry will form the basis of instruction for the course. Mandatory labs are scheduled on some Saturdays each year.

**Prerequisite:** *Biology I and Algebra II*

#### *Dual Enrollment Courses*

#### CHE 101 and 101L General Chemistry I and Lab (Dual Enrollment)

SCDOE No.: 323900EW

**1.0** HS Credit (units) **Fall**

**College credit:** 4SH

A course in basic chemical principles. Topics include: periodicity, stoichiometry, chemical and nuclear reaction types, coordination chemistry, atomic and molecular nomenclature, structure, and properties. **CHE 101L General Chemistry Laboratory accompanies CHE 101 and carries 1 credit;** it is designed to develop laboratory and mathematical skills through experiments that illustrate chemical concepts. Mandatory labs are scheduled on some Saturdays each semester.

**Prerequisite:** *Introduction to Chemistry or PI*

#### CHE 102 and 102L General Chemistry II and Lab (Dual Enrollment)

SCDOE No.: 324000EW

**1.0** HS Credit (units) **Spring**

**College credit:** 4SH

An introduction to the principles of chemical kinetics and thermodynamics and their application to chemical reactions, with an emphasis on solution chemistry. **CHE 102L General Chemistry Laboratory accompanies CHE 102 and carries 1 credit.** It is a continuation of CHE 101L, focused on the development of quantitative and analytical laboratory skills. Mandatory labs are scheduled on some Saturdays each semester.

**Prerequisite:** *CHE 101*

## Physics

### Dual-Enrollment Courses

#### PHY 203 and 203L Calculus Physics I and Lab (Dual Enrollment)

SCDOE No.: 324900EW

**1.0 HS Credit (units) Fall**

**College credit: 4SH**

A calculus-based course covering classical mechanics and dynamics. Topics include vector notation, kinematics, statics, dynamics, circular motion, work and energy, linear momentum, and rotational motion. **PHY 203L Calculus Physics Laboratory accompanies PHY 203 and carries 1 credit.** Experiments designed to illustrate the principles of physics covered in PHY 203. Mandatory labs are scheduled on some Saturdays each semester.

**Prerequisite:** MAT 231 (*Calculus I*)

#### PHY 204 and 204L Calculus Physics II and Lab (Dual Enrollment)

SCDOE No.: 325000EW

**1.0 HS Credit (units) Spring**

**College credit: 4SH**

A calculus-based course covering fluids, vibrations, waves, sound, electricity, magnetism, light, and optics. **PHY 204L Calculus Physics Laboratory II accompanies PHY 204 and carries 1 credit.** It includes experiments designed to illustrate the principles of physics covered in PHY204. Mandatory labs are scheduled on some Saturdays each semester.

**Prerequisite:** PHY 203

