



Governor's School for Science, Math & Technology

2021-2022	Mountain Vista Governor's School At-a-Glance
<b>Mission</b>	The mission of Mountain Vista Governor's School is to present a research-based, technology-enhanced, integrated program in mathematics, science, and the humanities. The program will challenge students to reach their full potential as independent thinkers capable of assuming leadership roles in a constantly changing global society.
<b>School Day</b>	<ul style="list-style-type: none"> <li>● 4.5 hour Governor's School daily instruction</li> <li>● 7:30 a.m. - 11:00 a.m.- student on-site day</li> <li>● 1 day a week for Focused Learning Experiences (FLEX) e.g. seminars, field experiences, special events</li> <li>● Web-communication systems to provide additional instructional time</li> </ul>
<b>Yearly Schedule</b>	<ul style="list-style-type: none"> <li>● Yearly academic calendar designed for best fit with participating divisions' calendars</li> <li>● Web-communication systems utilized when some students cannot be present due to weather, holidays, or other circumstances</li> </ul>
<b>Number of Students and Grade Levels</b>	<ul style="list-style-type: none"> <li>● Middletown Site—100+ high school students</li> <li>● Warrenton Site—100+ high school students</li> <li>● Grades 10-12</li> </ul>
<b>Site Description</b>	<ul style="list-style-type: none"> <li>● Two sites at Lord Fairfax Community College (LFCC)               <ul style="list-style-type: none"> <li>▪ Fauquier Campus to serve Culpeper, Fauquier, and Rappahannock</li> <li>▪ Middletown Campus to serve Clarke, Frederick, Warren, and Winchester City</li> </ul> </li> <li>● Sites connected by technology for two-way interaction among teachers and students</li> <li>● Lab facilities to support project-based and technology-enhanced learning opportunities</li> </ul>
<b>Curriculum Focus</b>	<ul style="list-style-type: none"> <li>● Science, Mathematics, Humanities, Research</li> <li>● Emphasis on interdisciplinary connections</li> <li>● Scholarly research with authentic application</li> <li>● Collaboration among faculty and students with community partnerships</li> <li>● Technology integration in all aspects of learning</li> <li>● Opportunity to earn college credit</li> </ul>
<b>Instructor Qualifications</b>	<ul style="list-style-type: none"> <li>● Content-area expertise with extensive teaching experience</li> <li>● Advanced degrees including gifted education training/endorsement</li> </ul>
<b>Diploma/Transcripts</b>	<ul style="list-style-type: none"> <li>● School Division diploma with Virginia Academic-Year Governor's School Seal</li> <li>● School Division transcript in addition to LFCC transcript for dual enrolled courses</li> <li>● Opportunity to earn an Associate's Degree or General Studies Certificate from LFCC upon high school graduation</li> </ul>
<b>Guidance Services</b>	<ul style="list-style-type: none"> <li>● College admission and scholarship counseling provided by MVGS counselors in addition to base school counseling support</li> </ul>
<b>Community Support</b>	<ul style="list-style-type: none"> <li>● Lord Fairfax Community College</li> <li>● MVGS Foundation 501(c)(3)</li> </ul>
<b>Summer Programs</b>	<ul style="list-style-type: none"> <li>● New Student Orientation</li> <li>● Summer Enrichment Opportunities</li> </ul>
<b>Distance Learning</b>	<ul style="list-style-type: none"> <li>● Web-communication to expand time for student-teacher interaction</li> <li>● Possible use of on-line courses to meet individual needs</li> <li>● Virtual/community research experiences to enhance classroom learning environment</li> </ul>
<b>Application/Selection</b>	<ul style="list-style-type: none"> <li>● Standard Application Packet using a multi-criteria format</li> <li>● School divisions' selection committees select students to attend</li> </ul>
<b>Transportation</b>	<ul style="list-style-type: none"> <li>● School divisions provide transportation from base schools to LFCC</li> </ul>

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Most up-to-date information available at [www.mvgshome.org](http://www.mvgshome.org)

## MVGS Three-Year Program/Program of Studies

Rising 10<sup>th</sup> graders will attend MVGS for three years and will choose the science strand option during the 10<sup>th</sup> grade year.

Several courses may be available to be dual enrolled for college credit through LFCC. See the course descriptions below.

Prerequisites: Geometry; Algebra II Honors (prerequisite for Math Analysis)      Co-requisites: General Biology

	Math	Science	Humanities	Research
<b>10<sup>th</sup> Grade</b>	<i>MVGS Math Analysis</i>	<i>MVGS Collegiate Chemistry</i>	<i>MVGS Humanities 10/English 10</i>	<i>MVGS Research 1: Introduction to Research</i>

MVGS offers two science focus options for second- and third-year students—typically 11<sup>th</sup> and 12<sup>th</sup> graders: Physics/Engineering or Biology/Life Science.

### Option I: Physics/Engineering Focus

Prerequisites: Math Analysis

	Math	Science	Humanities	Research and Elective
<b>11<sup>th</sup> Grade</b>	<i>MVGS Calculus 1</i>	<i>MVGS Physics 1: Mechanics</i>	<i>MVGS Humanities 11/English 11</i>	<i>MVGS Computer Science 1 or MVGS Economics <b>and</b> MVGS Research 2: Individual Research Project</i>
<b>12<sup>th</sup> Grade</b>	<i>MVGS Calculus 2/3: Multivariable</i>	<i>MVGS Physics 2: Electricity and Magnetism</i>	<i>MVGS Humanities 12/ US Government</i>	<i>MVGS Computer Science 1 or 2 or *MVGS Economics <b>and</b> MVGS Research 3: Capstone Project</i>

### Option II: Biology/Life Science Focus

Prerequisites: Math Analysis, General Biology, Chemistry

Co-requisites: recommend Physics either year

	Math	Science	Humanities	Research and Elective
<b>Second Year 11<sup>th</sup> Grade</b>	<i>MVGS Statistics</i>	<i>MVGS Biology 1: Collegiate Biology</i>	<i>MVGS Humanities 11 /English 11</i>	<i>MVGS Computer Science 1 or MVGS Economics <b>and</b> MVGS Research 2: Individual Research Project</i>
<b>Third Year 12<sup>th</sup> Grade</b>	<i>MVGS Calculus 1</i>	<i>MVGS Biology 2: Advanced Topics</i>	<i>MVGS Humanities 12/ US Government</i>	<i>Computer Science 1 or 2 or MVGS Economics <b>and</b> MVGS Research 3: Capstone Project</i>

Note: MVGS Economics will fulfill the VDOE graduation requirement for Economics and Personal Finance

<b>Courses Offered</b>	<b>AP Test Option</b>	<b>Graduation Credit</b>	<b>Dual Enrollment Option</b>
MVGS Collegiate Chemistry	Chemistry AP	Science	CHM 111-112
MVGS Physics 1: Mechanics	Physics / Mech AP	Science	PHY 241
MVGS Physics 2: Electricity and Magnetism	Physics C/ Elect. & M	Science	PHY 242
MVGS Biology 1: Collegiate Biology	Biology AP	Science	BIO 101-102
MVGS Biology 2: Advanced Topics	AP+	Science	BIO 150 & 270
MVGS Math Analysis	No	Math	Not offered
MVGS Calculus 1	Calculus AB AP	Math	MTH 263
MVGS Calculus 2/3	Calculus BC AP	Math	MTH 264 & 265
MVGS Statistics	Statistics AP	Math	MTH 240
MVGS Computer Science 1/ Research 2	Computer Science A AP	Elective	CSC 200 & 201
MVGS Computer Science 1/ Research 3	Computer Science A AP	Elective	CSC 200 & 201
MVGS Computer Science 2/ Research 3	AP+	Elective	CSC 202 & 205
MVGS Humanities 10/ English 10	No	English	HUM 241
MVGS Humanities 11/English 11	AP Language and Comp.	English	HUM 242
MVGS US Humanities 12/Govt	AP Government	US Government	PLS 135 & 241
MVGS Economics/ Research 2	AP Macroeconomics	Economics and Personal Finance	Not offered
MVGS Economics/ Research 3	AP Macroeconomics	Economics and Personal Finance	Not offered
MVGS Research 1	No	Elective	PHY 298

MVGS Academic Advisory Board recommendation is that courses earn weighted high school credit based on local division weighting policy/procedures, given the collegiate level/focus of MVGS courses. Be advised that students sign up for Advanced Placement (AP) testing through their base school counseling/testing departments, not through MVGS, if desiring that option.

## Mountain Vista Governor's School Course Descriptions

**MVGS Collegiate Chemistry** Collegiate Chemistry is an introductory college chemistry course. The curriculum is laboratory based and includes study in matter and measurement, atoms, molecules, ions, ionic and covalent bonding. Second semester includes study in liquids and solids, solutions, chemical kinetics, chemical equilibrium, and acids and bases. Upon successful completion of the course, students may be capable of and suited for the Advanced Placement (AP) Chemistry examination. Dual enrollment option is provided in CHM 111-112.

**MVGS Physics 1: Mechanics** Physics 1 is a calculus-based, first-year physics course. The primary focus of study will include the topics of Newtonian Mechanics and Thermodynamics. Inquiry-based laboratory investigations include extensive integration of technology. This course is integrated with MVGS Calculus 2. Upon successful completion of the course, students may be capable of and suited for the AP Physics C (Mechanics) examination. Dual enrollment option is provided in PHY 241.

**MVGS Physics 2: Electricity and Magnetism** Physics 2 is a calculus-based, second-year physics course. Inquiry is stressed and laboratory investigations incorporate extensive integration of technology. The primary focus of study will include the topics of Electricity and Magnetism and Modern Physics. This course is integrated with MVGS Calculus 2/3. Upon successful completion of the course, students may be capable of and suited for the AP Physics C (Electricity & Magnetism) examination. Dual enrollment option is provided in PHY 242.

**MVGS Collegiate Biology** Collegiate Biology is the equivalent of a two-semester college introductory biology course for biology majors. The curriculum is laboratory based and includes extensive integration of laboratory technology. Major units of study include Cell Processes, Ecology, Evolution and Genetics and Information Transfer. Upon completion of the course, students may be capable of and suited for the AP Biology examination. Dual enrollment option is provided in BIO 101-102.

**MVGS Biology 2: Advanced Topics** Biology 2 is a second-year college biology course which ties together biological principles with social and ethical implications. Students will explore advanced topics which may include ecology and microbiology. This course extends beyond the AP level. Dual enrollment option is provided in BIO 150 and BIO 270.

**MVGS Math Analysis** Math Analysis develops students' understanding of algebraic, trigonometric, exponential, logarithmic and transcendental functions, and parametric and polar equations. Investigating real world data will enhance the understanding of realistic applications through modeling. Graphing calculators and computers and other appropriate technological tools will be used to assist students. This course serves as the prerequisite for MVGS Calculus and MVGS Statistics. Dual enrollment and AP testing options are not provided.

**MVGS Calculus 1** Calculus 1 is a rigorous course in calculus with analytic geometry. Topics include concepts and applications of differential and integral calculus and an introduction of elementary differential equations. Upon successful completion, students may be capable of and suited for the Calculus AB AP examination. Dual enrollment option is provided in MTH 263.

**MVGS Calculus 2/3** The course is a fast-paced calculus course which includes multivariable calculus. Topics include concepts and applications of integral calculus and an introduction of elementary differential equations, methods of integration, sequences and series, power series, Taylor and Mclaurin series, study of polar and parametric functions, three-dimensional analytical geometry, vector analysis, vector functions, multivariate functions, partial derivatives, optimization, double and triple integrals. Upon successful completion, students may be capable of and suited for the Calculus BC AP examination. Dual enrollment option is provided in MTH 264 and MTH 265.

**MVGS Statistics** This course is a study of descriptive and analytical statistics. Students will learn and apply four broad conceptual themes which include exploring data, planning a study, anticipating patterns, and statistical inference. Students will use statistics as a tool to predict, investigate, and analyze a variety of statistical and research problems. Upon successful completion, students may be capable of and suited for the Statistics AP examination. Dual enrollment option is provided in MTH 240.

**MVGS Humanities 10: The Power of Thought / English 10** Beginning with philosophical systems of thought, this Humanities course will engage students in an exploration of the philosophical and historical foundations of knowledge against the broader background of Western thought as it applies to classical and modern literature, science, and mathematics. Emphasis is on examining the contributions of key thinkers to classical and contemporary cultural and scientific thought, with an eye toward understanding the shifting nature of knowledge and the folly of certainty. Students will earn one English credit, which will meet the requirement for English 10, including the Virginia Standards of Learning requirements. AP testing option is not provided, but the course is culminating with Humanities 11. Dual enrollment option is provided in HUM 241.

**MVGS Humanities 11: The Search for Identity/English 11** Engaging in an exploration of the human drive for individual identity across cultures and time, this Humanities course will require students to develop an understanding of the concepts of self, maturity, citizenship, and the questionable attainment of perfection. Emphasis is on the themes found in literature, psychology, philosophy, and science which illuminate the quest to establish our identities within the framework of our communities and the broader context of human experience. Students will earn one English credit, which will meet the requirement for English 11, including the Virginia Standards of Learning requirement. Upon successful completion of the course, students may be capable of and suited for the AP English Language and Composition Exam. Dual enrollment option is provided in HUM 242.

**MVGS Humanities 12: Political Philosophy and US Government** Humanities 12 introduces students to the key philosophies, institutions, policies, and behaviors political systems. Students will learn to apply disciplinary reasoning to assess the causes and consequences of political events, interpret data to develop evidence-base arguments, and defend political positions and solutions while cultivating ethical dispositions and leadership skills which can be applied to contemporary, domestic, and international problems. Students will earn one US Government credit, which will meet the requirements for Virginia & US Government per the VDOE. Upon successful completion of the course, students may be capable of and suited for the AP Exam in United States Government and Politics. Dual enrollment option is provided in PLS 241 and PLS 135.

**MVGS Research 1: Introduction to Research** The students' review of literature, analysis of arguments, and evaluation of experiment designs will enable them to explore basic research components. The students will use statistical and technological tools to organize and integrate information, design studies and experiments, gather data, and plan individual research projects. AP option is not available. Dual enrollment credit may be offered as PHY 298.

**MVGS Economics/Research 2 or Research 3** Students develop critical thinking skills through the understanding, application, and analysis of micro and macroeconomic concepts and structures. Students will gain an understanding of economics principles as they apply to free markets and global systems. They will develop familiarity with economics models and graphs, scarcity and choices, supply and demand, elasticity, economic performance measures, national income and price determination, the financial sector, factors that affect income and economic growth, and stabilization policies. Students will gain an understanding of their role in the financial markets. This course can be used to meet the Economics and Personal Finance diploma requirement. Upon successful completion, students may be capable of and suited for the AP Macroeconomics Exam. Dual enrollment option is not provided

**11<sup>th</sup> Grade: Research 2**--The MVGS Independent Research Project is included in the economics elective for juniors. Students will apply principles of effective research by engaging in academic and scientific research through quantitative studies utilizing laboratory experiments, field studies, interviews, and/or surveys. Students will develop oral, written, and technological skills through the presentation and publication of their research.

**12<sup>th</sup> Grade: Research 3**--The MVGS Capstone Project is included in the economics elective for seniors. Students will develop and implement a plan to address a current issue, conduct research for competition and/or publication, compete in engineering design fairs and/or challenges, or participate in an internship. These activities may further extend the MVGS Independent Research Project or initiate new projects. Further individualized options are possible but will require formal faculty approval. AP and dual enrollment options are not provided for Research 2 & 3.

**MVGS Computer Science 1/ Research 2 or Research 3** Fall semester provides a broad introduction to computer science discussing architecture and function of computer hardware, including networks and operating systems, data and instruction representation and data organization. Software, algorithms, programming languages and software engineering using the Python language as well as artificial intelligence, cyber security and theory of computation are key course topics. Spring semester focuses on problem solving methods using algorithms with the Java language, emphasizing structured programming concepts, and data structures. Upon successful completion, students may be capable of and suited for the Computer Science A AP examination. Dual enrollment option is provided in CSC 200-201.

**11<sup>th</sup> Grade: Research 2**--The MVGS Independent Research Project is included in the CS elective for juniors. Students will apply principles of effective research by engaging in academic and scientific research through quantitative studies

utilizing laboratory experiments, field studies, interviews, and/or surveys. Students will develop oral, written, and technological skills through the presentation and publication of their research.

**12<sup>th</sup> Grade: Research 3**--The MVGS Capstone Project is included in the CS elective for seniors. Students will develop and implement a plan to address a current issue, conduct research for competition and/or publication, compete in engineering design fairs and/or challenges, or participate in an internship. These activities may further extend the MVGS Independent Research Project or initiate new projects. Further individualized options are possible but will require formal faculty approval. AP and dual enrollment options are not provided for Research 2 & 3.

### **MVGS Computer Science 2/ Research 2 or Research 3**

Fall semester examines the hierarchical structure of computer architecture, focusing on multi-level machine organization and using a simple assembler language to complete programming projects. Included are processors, instruction, execution, addressing techniques, data representation and digital logic. Spring semester examines data structures (including sets, strings, stacks, queues, arrays, records, files, linked lists, and trees), abstract data types, and algorithm analysis (including searching and sorting methods), and objects. Hands-on work is performed in the C++ language. This course extends beyond the AP level. Dual enrollment option is provided in CSC 202 & CSC 205.

**11<sup>th</sup> Grade: Research 2**--The MVGS Independent Research Project is included in the CS elective for juniors. Students will apply principles of effective research by engaging in academic and scientific research through quantitative studies utilizing laboratory experiments, field studies, interviews, and/or surveys. Students will develop oral, written, and technological skills through the presentation and publication of their research.

**12<sup>th</sup> Grade: Research 3**--The MVGS Capstone Project is included in this CS course for seniors. Students will develop and implement a plan to address a current issue, conduct research for competition and/or publication, compete in engineering design fairs and/or challenges, or participate in an internship. These activities may further extend the MVGS Independent Research Project or initiate new projects. Further individualized options are possible but will require formal faculty approval. AP and dual enrollment options are not provided for Research 2 & 3.