Heritage High School

Governor's STEM Academy

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NEWPORT NEWS PUBLIC SCHOOLS

as of November 2017

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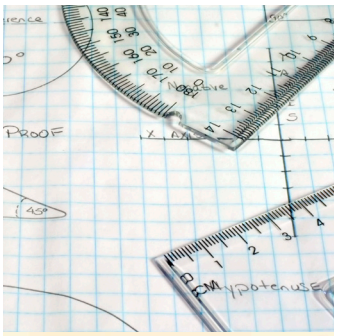
Governor's STEM Academy

as of July 2016



What is the Heritage High School Governor's STEM Academy?

The Heritage High School Governor's STEM Academy offers a program of study designed to expand options for high school students to acquire skills in Science, Technology, Engineering and Mathematics (STEM).

Students will gain the knowledge and skills needed to succeed in technologically-rich workplaces by learning to work in teams, to communicate effectively and to apply the principles of science, technology, engineering and mathematics.

What does the program require of students?

In order to complete the program successfully, a student must:

- Complete an advanced mathematics course beyond Algebra II;
- Maintain a minimum 3.0 GPA;
- Take a mathematics, science and technology course each year;
- Complete a STEM work-based internship or job shadowing (minimum of 15 hours);
- Complete courses within a specific pathway in STEM, Information Technology or A/V Technology and Telecommunications Career Clusters;
- Earn an industry certification;
- Complete 200 hours of school/community service;
- And complete the Senior STEMinar course.

Heritage High School
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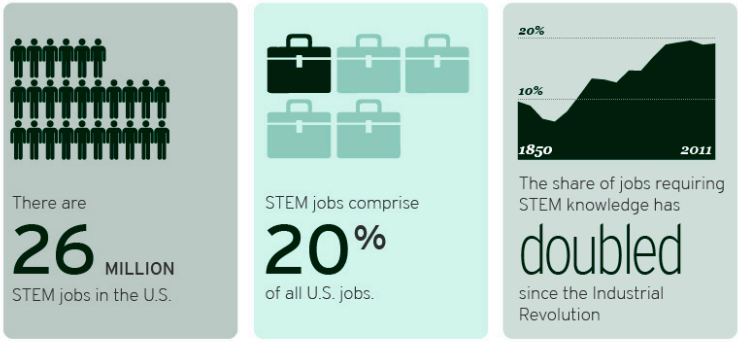
STEM Education

Facts About STEM Education



STEM occupations requiring the most knowledge

Occupation	# of jobs	avg. wages
Biomedical Engineers	16,590	$88,360
Chemical Engineers	27,860	$99,440
Biochemists and Biophysicists	25,160	$87,640
Engineers, All Other	125,590	$92,260
Nuclear Engineers	18,430	$105,160
Agricultural Engineers	2,650	$78,400
Materials Scientists	7,900	$86,600
Engineering Teachers	33,660	$97,260
Hydrologists	6,960	$79,070
Materials Engineers	22,160	$86,790

Most common STEM occupations requiring an Associate's Degree or less

Occupation	# of jobs	avg. wages
Registered Nurses	2,724,570	$69,110
Auto Techs and Mechanics	589,570	$38,560
Carpenters	578,910	$44,330
Supervisors of Prod. & Ops. Workers	559,350	$56,890
Electricians	512,290	$52,910
Computer Systems Analysts	487,740	$82,320
Supervisors of Mechanics, etc.	418,530	$62,190
Machinists	368,510	$40,520
Plumbers, Pipefitters, Steamfitters	349,320	$51,830
Welders, Cutters, Solderers, Brazers	316,290	$37,920

Source: The Brookings Institution, 2015.

The chart below lists some of the fastest growing STEM/Technical occupations projected through 2022 according to the Bureau of Labor Statistics:

Student STEM Checklist

If you think you would be interested in a career in STEM, check your potential for success by answering these questions:

- *Do you enjoy science, technology, engineering and/or mathematics?*
- *Do you have an inquisitive and searching mind?*
- *Are you interested in knowing what makes things work?*
- *Do you enjoy taking things apart and putting them back together?*
- *Do you like to solve problems and puzzles?*
- *Do you like to create things?*
- *Do you enjoy learning?*
- *Do you enjoy working with computers?*
- *Do you enjoy playing video games and would like to make your own?*
- *Do you achieve good grades?*

If you answered 'YES' to most of the questions, you may want to consider a career in STEM!

Fastest Growing STEM and Technical Occupations in the United States (Projected to 2022)

Occupation	2012*	2022*	Percentage Growth
Cyber Ops & Information Security Analysts	75.1	102.5	37%
Statisticians	27.6	34.9	27%
Biomedical Engineers	19.4	24.6	27%
Environmental Engineers	38.5	48.4	26%
Network & Computer Systems Analysts	520.6	648.4	25%
Software Application Developers	613	752.9	23%
Civil Engineer	272.9	326.6	20%

*Numbers in Thousands

Source: Bureau of Labor Statistics www.bls.gov

Program Areas

In addition to taking English, Math, Science, Social Studies, Physical Education and World Languages, students will take a technology course each year related to their career interest.

Program areas and courses are listed below. Students are required to take these courses in the prescribed sequence.

Students are also required to take the STEMinar course during their 12th grade year. **(See page 7)**

Program Areas	9th Grade	10th Grade	11th Grade	12th Grade
Engineering and Robotics	Introduction to Engineering Design	Principles of Engineering	Digital Electronics*	Engineering Design & Development*
Computer Science and Game Design	Programming	AP Computer Science Principles	Digital Visualization	Modeling & Simulation Technology*
Networking and Cybersecurity	Information Technology Fundamentals	Computer Network Operations	Advanced Computer Network Operations*	Cybersecurity*

** Honors Course*

Note: Students pursuing an Advanced Studies Diploma must complete three years of one World Language or two years of two different World Languages.

- Availability of career strands and courses are based upon student enrollment/course requests.
- See Page 8 for recommended curriculum map.

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Course Descriptions

Advanced Computer Network Software Operations—This advanced networking course continues to teach aspects of network administration, focusing on the management and support of network users and systems. The topics covered include understanding the responsibilities of computer professionals, training end users, evaluating new technology, developing system policies, troubleshooting workstations, managing network services and protocols, and effectively using email and business communications. Students learn communication protocols, troubleshooting techniques for systems and client-server networks, website management, and other advanced networking topics.

AP Computer Science Principles—Building on a foundation of programming skills, students will use object-oriented programming to develop applications for Windows, database, multimedia, games, mobile, and/or Web environments. Students will have the opportunity to explore and create applications related to the information technology and game design industries. The course material emphasizes programming concepts, algorithm designs, and documentation of the computer solution while preparing students to take the Advanced Placement (AP) Computer Science Principles test.

Computer Network Software Operations—Building on the foundations of information technology, this course provides students with the skills associated with computer support and network administration. Students receive training in procedures for optimizing and troubleshooting concepts for computer networks and sub-systems. Students will gain experience as they create network connections, install operating systems, set up and manage accounts, load software, and establish and implement security plans.

Cybersecurity—The course will provide learners with principles of data and technology that frame and define cybersecurity. Learners will gain insight into the importance of cybersecurity and the integral role of cybersecurity professionals. The interactive curriculum will provide a dynamic learning experience where users can explore foundational cybersecurity principles, security architecture, risk management, attacks, incidents, and emerging Information Technology and Information Security technologies.

Digital Visualization—Students will gain experiences related to computer animation by solving problems involving 3D object manipulation, story boarding, texture mapping, lighting concepts and environmental geometry.

Digital Electronics—Students use computer simulations to learn about the logic of electronics as they design, test, and actually construct circuits and devices. They apply control system programming and explore sequential logic and digital circuitry fundamentals. Topics in computer circuitry are also presented. *(Project Lead The Way course)*

Engineering Design & Development—The knowledge and skills students acquire throughout PLTW Engineering come together in Engineering Design and Development (EDD) as they identify an issue and then research, design, and test a solution, ultimately presenting their solution to a panel of engineers. Students apply the professional skills they have developed to document a design process to standards, ready to take on any post-secondary program or career. *(Project Lead The Way course)*

Course Descriptions (Cont.)

Information Technology Fundamentals—This course introduces the essential skills needed for students to pursue specialized programs leading to technical and professional careers and certification in the Information Technology (IT) industry. Students have the opportunity to investigate career opportunities in four major IT areas: Information Services and Support, Network Systems, Programming and Software Development, and Interactive Media.

Introduction to Engineering Design—In this foundation course students use 3D computer modeling software as they learn the engineering design process and solve design problems for which they develop, analyze, and create product models. Students use the engineering design process, applying math, science, and engineering standards to hands-on projects. Students work both individually and in teams to design solutions to a variety of problems using 3D modeling software, and use an engineering notebook to document their work. *(Project Lead The Way course)*

Modeling and Simulation Technology—Students will explore the use of modeling, simulation and game development software to solve real-world problems in STEM. The activities include evaluating physics simulations, programming games for educational purposes and creating visualization systems with 3D models.

Principles of Engineering Design—Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation. *(Project Lead The Way course)*

Programming—Students explore computer concepts, apply logic procedures, and implement programming procedures with one or more languages, such as Visual Basic. Net, Java, C#, and C++. Graphical User Interfaces, such as Alice, Game Maker, and Flash, may be used as students design and develop interactive multimedia applications. In addition, HTML or JavaScript may be employed to create Web pages.

STEMinar—This course is designed to advance student's preparation in critical reading, technical writing, college and workplace readiness and career-ready communication. Students will enhance their skills in STEM by participating in STEM work-based learning experiences to include participation in job shadowing and internships; creation of electronic portfolios; and digital media presentations. Students will complete a STEM research project and culminating portfolio which will demonstrate the student's mastery in their specified STEM career pathway.

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Governor's STEM Academy

Heritage High School Governor's STEM Recommended Curriculum Map

9th GRADE

- Honors English 9
- Algebra II or Honors Geometry
- Honors Earth Science , Biology or AP Environmental Science
- Honors World Geography or AP Human Geography
- Introduction to Fitness/Health I
- World Language
- Governor's STEM Academy Elective

10th GRADE

- Honors English 10
- Honors Geometry; Algebra II; or Honors Algebra II
- Honors Earth Science, Biology or Chemistry
- Honors or AP World History
- Fitness II/Health II/Driver's Education
- World Language
- Governor's STEM Academy Elective

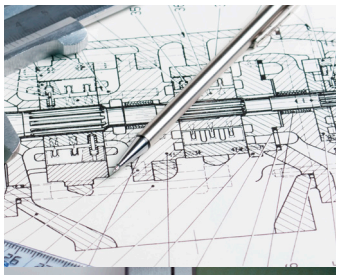
11th GRADE

- Honors or AP English 11
- Honors Algebra II; Trigonometry/ Elementary Functions; or Honors Math Analysis
- Honors or AP Chemistry; Physics, AP Biology; or AP Environmental Science
- Honors or AP US History
- World Language
- Economics & Personal Finance
- Governor's STEM Academy Elective

12th GRADE

- Honors or AP English 12
- Honors Math Analysis; AP Calculus; or Trigonometry/Elementary Functions
- Forensic Science; Marine Biology; Zoology, Ecology; AP Physics; or AP Environmental Science
- Honors or AP Government
- World Language or Elective
- STEMinar
- Governor's STEM Academy Elective

Related Occupations



Listed below are some related occupations applicable to the Heritage High School Governor's STEM Academy program areas:

Engineering and Robotics

- Aerospace Engineer
- Mechatronics (Robotics) Engineer
- Aerospace Engineer
- Chemical Engineer
- Industrial Engineer
- Electrician
- Sound Engineering Technician
- Architectural or Civil Engineer
- Computer Aided Drafter (CAD)
- Technical Writer
- Mechanical Engineer
- Broadcast & Sound Engineering Technician

Computer Science and Game Design

- Computer Programmer
- Game Developer
- 3D Animator
- Web Designer or Webmaster
- Graphic Artist
- Software Applications Engineer
- Database Administrator
- Multimedia Programmer/Producer
- Network Simulation Engineer
- Renderer
- Operating System Designer
- Modeling & Simulation Engineer

Computer Networking and Cybersecurity

- Network Administrator
- Cybersecurity Analyst
- Network or Computer Technician
- Technology Support Specialist
- Software Security Engineer
- Cyber Forensics Analyst
- Information Technology Specialist
- Cryptographer
- Data Communications Analyst
- Security Software Developer
- Certified Ethical Hacker
- Telecommunications Network Technician
- PC Repair Technician
- Telecommunications Manager

Community Service and Internships

Community Service

Students enrolled in the Heritage High School Governor's STEM Academy are required to complete a minimum of 200 hours of school/ community service during their four years of high school.

Students are able to gain experience in various fields while helping others and improving their community.

Internships

As part of Heritage High School Governor's STEM Academy, students are required to complete a minimum of 15 internship experience hours during their 12th grade year.

The internship experience should contribute to the student's career objectives.

Dual Enrollment Opportunities

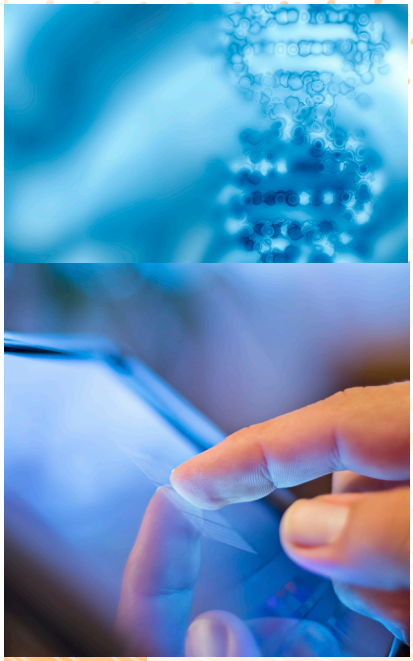
In partnership with Thomas Nelson Community College (TNCC), high school juniors and seniors may be eligible to receive college credit for courses taken in Newport News Public Schools. Students who complete dual enrollment courses receive college credit toward high school graduation as well as college credit on an official Thomas Nelson Community College transcript. These credits may be used to continue college at TNCC, or transfer to other institutions. For more information regarding dual enrollment opportunities, contact your school counselor for course and teacher availability.

Note: *Courses must have a dual enrollment approved teacher to receive TNCC credit.*

Industry Certifications

Industry certifications are professional licenses or skill assessments that demonstrate students have acquired the skills needed in specific areas and provide for career paths that can lead to advancements and potential higher certification ratings.

Students enrolled in the Governor's STEM Academy at Heritage High School have the opportunity to obtain various industry certifications such as:



STEM Courses and Related Certifications:

Engineering & Robotics

REC Foundation Engineering & Robotics Certification
Electronics Technology Assessment (ETA)
PLTW End-of-Course Tests

Computer Science and Game Design

Microsoft Technology Associate: Programming
Microsoft Technology Associate: App Development
Microsoft Technology Associate: Software Development

Networking and Cybersecurity

IC3 Digital Literacy Certification
Microsoft Technology Associate: Networking
Microsoft Technology Associate: Security

* Workplace Readiness Skills for the Commonwealth Examination is offered in all Governor's STEM Academy courses

*Contact your school counselor for additional certifications that are available in other courses.

Diploma Seals

Students in the Heritage High School Governor's STEM Academy have the opportunity to receive the following diploma seals upon graduation:

Governor's STEM Academy Seal (Virginia Governor's Career and Technical Academies Seal)
Awarded to Heritage High School students who complete the requirements for the Heritage High School Governor's STEM Academy:

- Complete an advanced mathematics course beyond Algebra II;
- Maintain a minimum 3.0 GPA
- Take a mathematics, science, and technology course each year
- Complete a STEM work-based internship (minimum of 15 hours)
- Complete courses within a specific pathway in STEM, Information Technology, A/V Technology or Telecommunications
- Earn an industry certification and at least nine transferrable college credits
- Complete 200 hours of school/community service
- Complete the Senior STEMinar course

Governor's Seal
Awarded to students who complete the requirements for an Advanced Studies Diploma with an average grade of "B" or better, and successfully complete college-level coursework that will earn the student at least nine transferable college credits in Advanced Placement (AP), International Baccalaureate (IB), Cambridge or dual enrollment courses.

Board of Education's Seal of Advanced Mathematics and Technology
Awarded to students who earn either a Standard or Advanced Studies Diploma and satisfy all of the mathematics requirements for the Advanced Studies Diploma (four units of credit including Algebra II; two verified units of credit) with a "B" average or better; and do one of the following:

- Pass an examination in a career and technical education field that confers certification from a recognized industry, or trade or professional association;
- Acquire a professional license in a career and technical education field from the Commonwealth of Virginia;
- Pass an examination approved by the board that confers college-level credit in a technology or computer science area.

Diploma Seals (Cont.)

Board of Education's Career and Technology Education (CTE) Seal

Awarded to students who earn a Standard or Advanced Studies Diploma and complete a prescribed sequence of courses in career and technical education concentration or specialization that they choose and maintain a "B" or better average in those course.

- Fulfill the requirements for either a standard or advanced studies diploma;
- Complete a prescribed sequence of courses in a CTE concentration AND;
- Maintain a B or better average in their CTE concentration courses OR pass an exam that confers an approved certification, license and/or assessment.

Visit

http://www.doe.virginia.gov/instruction/graduation/diploma_seals/index.shtml for more information regarding graduation requirements and diploma seals.

The above information is subject to change based on VDOE and program updates.

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For Additional Information

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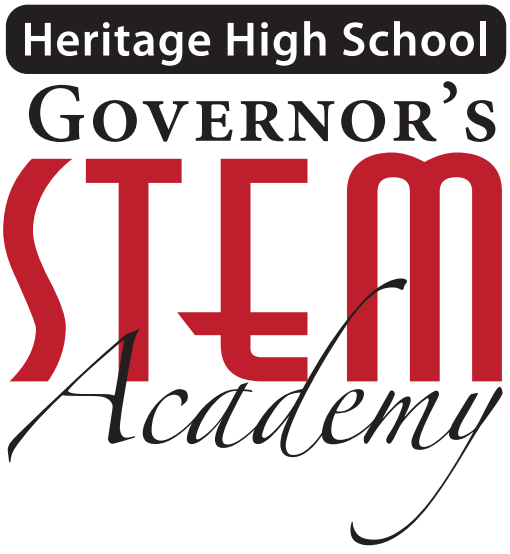
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