



North Carolina  
School of Science  
and Mathematics

# IVC, Enrichment, and Accelerator 2018-19 Course Catalog



**Design Your Future.**



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## Welcome from the Dean

Dear principal, counselor, or IVC facilitator,

I hope that you are well and having a great school year! Here in Durham, North Carolina, at the North Carolina School of Science and Math, we are having a great year teaching and learning from students in schools and communities across the state.

We're also excited about, and busy preparing for the 2018-2019 school year!



Thank you for considering a partnership with us so that, together, we can offer advanced level, high-quality teaching and learning for academically-gifted students in your community and throughout the state of North Carolina!

A key part of our mission at the North Carolina School of Science and Mathematics is to provide high-quality, tuition-free high school courses to North Carolina high schools. This year, we are serving students in 31 different public schools with interactive video conference courses, and an additional 358 students are enrolled in our NCSSM Online program.

If you've worked with us before, we look forward to serving your school again in 2018-2019. If your school has not yet participated in NCSSM's distance education courses, we hope our programs will position your school to offer coursework that isn't otherwise available, alleviate resource and scheduling difficulties, or build capacity in the areas of mathematics, science, engineering, and Advanced Placement.

This catalog lists all of the courses available to NC public school students through two programs: Interactive Video Conference (IVC), and NCSSM Online. IVC courses are available to any student in any NC public high school who meets the course prerequisites. NCSSM Online courses require students to apply for admission to our program. However, both programs can be used to supplement the offerings at your school for students who seek advanced opportunities in mathematics, science, and some humanities courses.

Returning sites may be pleased to see the following changes to our program:

- More IVC enrichment sessions to our catalog of offerings;
- New IVC courses in Applications of Mathematics, Coding for Girls, Public Health Topics, and an additional section in Honors Computer Science and Honors African American Studies; and
- Links to descriptions of our Summer Accelerator course offerings (several new courses to select from).

Please share these tuition-free offerings widely within your school community. I also invite your feedback on any aspect of our program. I can be reached at [lathan@ncssm.edu](mailto:lathan@ncssm.edu) or (919) 416-2721.

Sincerely,

A handwritten signature in black ink that reads "Jamie L. Lathan, Ph.D." The signature is written in a cursive, flowing style.

Dr. Jamie Lathan, Dean of Distance Education & Extended Programs

## About NCSSM

The North Carolina School of Science and Mathematics (NCSSM) has been a global leader in STEM education for more than 30 years. The school has a mission to serve as a public residential high school educating academically talented North Carolinians to become state, national and global leaders in science, technology, engineering and mathematics; to advance public education in North Carolina; and to inspire innovation for the betterment of humankind.

Since opening its doors in 1980 as the first public residential school with a focus on STEM, NCSSM has become a model for dozens of other schools across the country and globe and is a founding member of the National Consortium for Specialized Secondary Schools of Mathematics, Science, and Technology.

In 2007, NCSSM also became the first high school to become a constituent institution of the University of North Carolina.

NCSSM Distance Education Administration

Dr. Todd Roberts NCSSM Chancellor

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Jennifer Betz Senior Associate Registrar

Melissa Thibault Vice Chancellor for Distance Education & Extended Programs

Dr. Jamie Lathan Dean of Distance Education & Extended Programs

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## About NCSSM Distance Education

NCSSM began offering distance education courses via the Information Highway in 1994. Since that time, over 10,000 students have participated in video courses for high school credit—many of them in Advanced Placement. While the program initially served rural schools, it has expanded to include all North Carolina schools. As video has become cheaper and broadband access to schools has increased, the program has grown, with new courses being added regularly.



NCSSM Online welcomed its first cohort, the class of 2010, in 2008. This program, which includes weekly synchronous sessions, on-campus summer Accelerator courses, and residential weekends throughout the school year, welcomes students to the NCSSM experience without requiring that they leave their home communities. Students are provided textbooks and academic counseling, and they are eligible to participate in some NCSSM extracurricular activities, even attending prom at NCSSM.

Students participating in NCSSM Distance Education courses routinely advance to the most prestigious colleges and universities in the country, including UNC-Chapel Hill, NC State University, Duke University, California Institute of Technology, Yale University, the United States Air Force Academy, and others. Participants have received numerous scholarships, including the Morehead-Cain Scholarship and the Park Scholarship.

These programs remain tuition-free to all students.

#### About Two-Course Sequences:

To fully address the AP curriculum and build appropriate depth, knowledge, and application of the curriculum, NCSSM offers the AP content in a two-semester, year-long curriculum. Fundamental concepts and skills, as well as some in-depth topics are addressed in an honors-level elective course offered in the fall. The elective is a prerequisite and required to enroll in the corresponding AP course in the spring, which continues in-depth topics and prepares students to take the AP test. Students then earn 1 honors credit in the fall and 1 AP credit in the spring.



## Interactive Video Conference (IVC) Courses

### ABOUT IVC

The North Carolina School of Science and Mathematics (NCSSM) is the premier provider of [interactive videoconference \(IVC\) courses](#) for K-12 schools across North Carolina. Courses are provided tuition-free to schools across the state, providing students with the opportunity to take advanced coursework in a technology-rich environment.

With two-way video-conferencing, students from schools across the state can collaborate in project teams and whole-class discussions, developing the skills required by business and industry. NCSSM IVC teachers monitor the class in real time, assessing student learning and ensuring that students engage with the course materials and with each other.

NCSSM IVC provides a flexible, cost-effective solution for schools looking to:

- Offer courses in hard-to-staff subject areas
- Support STEM goals
- Offer advanced coursework to smaller groups of students

### Quick Facts

- NCSSM has offered tuition-free IVC courses to North Carolina schools since 1994.
- All NCSSM instructors have an advanced degree in their subject area.
- NCSSM operates four high definition IVC studios.
- Over 450 students enroll in NCSSM IVC courses annually.
- 35% of all North Carolina LEAs utilize NCSSM IVC courses.
- NCSSM IVC courses have course codes in NC's PowerSchool implementation.
- Courses are offered in 70-minute blocks throughout the school day. (Students will be expected to work independently for 20 minutes daily.) NCSSM accommodates multiple school calendars.
- Schools enroll the students. There is no student application to NCSSM for IVC courses.



- Registration priority will be given to schools with a minimum of 3 students in a given course. One and two student requests will go on a 30 day waitlist and will be notified as they are their placement is confirmed.
- Enrollment is on a first-come, first-served basis.
- Classes are capped at 25 students.

Two-way video-conferencing allows students to see and hear the instructor and the other class participants, wherever they are in the world, in real time.

Once confined to expensive video classrooms, students can now participate in IVC courses if they have a computer, webcam, and software that costs less than \$200. Schools can set up basic IVC classrooms by using:

- USB microphone, external speakers, Logitech Laptop Camera, Polycom RealPresence software and a laptop connected to a flat-panel monitor, LCD projector or Smartboard.
- Individual students can now participate with an iPad using a free app from Polycom.
- Schools, for \$15 a month, can lease software from MCNC called Movi-Jabber. This software can be loaded on a laptop that is equipped with a camera and microphone which will allow 1 or 2 students to participate this way.

Using IVC technology, NCSSM connects with schools all over the world.

### **Resources Needed**

- Schools provide textbooks, classroom space, and a computer for each student to use during class.
- Schools identify an adult facilitator who proctors exams, supervises the students while they're in the classroom, and serves as a conduit for communication between NCSSM and the school.
- Schools enter attendance and grades provided by NCSSM into PowerSchool.

## Fixed Broadcast Times for Schedules for IVC Courses

To accommodate as many different North Carolina high school daily schedules as possible and to exemplify blended approaches to teaching and learning, all NCSSM IVC courses will be taught using a maximum of seventy (70) minutes of live, synchronous, time and a minimum of twenty (20) minutes of asynchronous time. With this arrangement, before or after the seventy minutes of teacher-led instruction, students can collaborate with each other or work individually with the teacher using discussion boards, pre-recorded video sessions, online learning tools and games, and project-based lessons and activities.



## How to Enroll

Descriptions of the 2018-2019 courses are listed in this catalog. Select the courses your school would like to offer to your students. Include the descriptions of these selected courses in your school course registration materials to provide your students.

In February, NCSSM course registration forms for Fall Semester and Spring Semester 2018- 2019 will be posted on the NCSSM website (<http://www.ncssm.edu/ivc-courses>). Complete the registration forms; include the following information:

- Complete separate forms for each course a student wishes to take.
- Provide the contact information for the Interactive Video Conference facilitator and a counselor.
- Provide the name and grade level of the student. One form must be completed for each student.

**Registration priority** will be given to schools with a minimum of 3 students in a given course. One and two student requests will go on a waitlist and will be notified as they are their placement is confirmed.

The maximum number that each school may register in an individual course is eight; schools may register up to eight students for as many courses as needed.

Once a course is full, students will be added to a waitlist.

Within 7 days of completing the registration form, registration will be confirmed for schools registering a minimum of 3 students in a given course.

Students enrolled in Honors Forensic Science are required to complete a short pre-test, administered by school personnel, before registration can be confirmed. This test will be automatically sent for any Honors Forensic Science requests.

All registration materials are posted at <http://www.ncssm.edu/ivc-courses>.

## Technical Requirements

Once an expensive initiative, Interactive Video Conferencing is now very affordable for schools. Recent developments in laptop-based and mobile device-based clients have created new opportunities for students to participate in NCSSM interactive video conference courses.

IVC courses require broadband internet, and:

- Existing video-conferencing equipment in the school, such as Cisco-Tandberg or Polycom units. If your school has participated in interactive video courses with NCSSM, this equipment is likely already in place.

—or—

- A classroom equipped with a computer, projector, webcam, speakers, and desktop conference microphone can be converted into a video conference classroom with affordable software Polycom RealPresence Desktop For Windows and Mac.

—or—

- In cases where a full classroom is not available, individual students may participate by laptop (webcam and headset required);

### Tablet

<https://play.google.com/store/apps/details?id=com.polycom.cmad.mobile.android&hl=en>

### iPad

<https://itunes.apple.com/us/app/polycom-realpresence-mobile/id465412616?mt=8>

**Another software program that can be used to connect to our classes is the Movi-Jabber client software rented from MCNC for \$15 per month.**

**Contact MCNC at 919-248-1410 to inquire about this software solution**

<https://www.mcnc.org/services/point-to-point-multi-point-sessions.html>

If individual students are participating, remember that they will need space where they can talk freely, as courses are truly interactive.

NCSSM offers schools support in connecting their video conference classrooms, such as:

- live testing (upon request)
- troubleshooting assistance
- guidance for IT personnel

### **The Facilitator**

Key to the success of the Interactive Video Conference experience is the facilitator—an adult at the school site who works with the students and the NCSSM instructor to ensure a positive learning environment.

Expectations for facilitators include:

- Maintaining a safe, productive environment for students in the Interactive Video Conference classroom.
- Performing some classroom management functions, including entering student attendance into PowerSchool.
- Administering and proctoring tests and quizzes designed by the NCSSM instructor.
- Troubleshooting minor technical issues, such as muted volume, unplugged cables, or pointing and zooming the camera.
- Communicating with the NCSSM instructor about school closures, schedule changes, or classroom issues that affect student learning.
- Receiving grades from the NCSSM instructor.
- 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 facilitators in order to build content knowledge, pedagogical knowledge, and/or capacity to offer the IVC course as a face-to-face course in the future. NCSSM often provides teacher mentoring for subject-area teachers who serve as IVC facilitators. For more information on IVC mentoring relationships, contact Dr. Jamie Lathan at [latthan@ncssm.edu](mailto:latthan@ncssm.edu).

**Fall 2018**

<b>1st Block</b>	<b>2nd Block</b>	<b>3rd Block</b>	<b>4th Block</b>
Honors Forensic Science 8:15 - 9:25	Honors Forensic Science 10:15 - 11:25	Honors Genetics and Biotechnology 11:40 - 12:50	Honors African American Studies 1:45 - 2:55
Honors Aerospace Engineering 8:15 - 9:25	Honors Genetics and Biotechnology 9:50 - 11:00	Honors Cryptography & Computer Programming 11:40 - 12:50	Honors Physics 1:45 - 2:55
	Honors Statistics** 9:50 - 11:00	Honors Calculus AB** 11:40 - 12:50	Honors Computer Science Principles** 1:30 - 2:40 (Blended online & IVC)
		Honors Connected Computing: Solving Global Challenges w/Code 11:40 - 12:50	

*\*\* Indicates a 2-course sequence. Students must register for fall and spring courses in the sequence.*



## Spring 2019

1st Block	2nd Block	3rd Block	4th Block
Honors Forensic Science 8:05 - 9:15	Honors Forensic Science 9:50 - 11:00	Honors Genetics and Biotechnology 11:40 - 12:50	Honors African American Studies 1:30 - 2:40
Honors Aerospace Engineering 8:05 - 9:15	Honors Applications of Mathematics 9:50 - 11:00	Honors Cryptography & Computer Programming 11:40 - 12:50	Honors Physics 1:30 - 2:40
	AP Statistics** 9:50 - 11:00	Honors Calculus AB** 11:40 - 12:50	AP Computer Science Principles** 1:30 - 2:40 (Blended online & IVC)
	Honors Public Health Topics 10:15 - 11:25		

*\*\* Indicates a 2-course sequence. Students must register for fall and spring courses in the sequence.*

## IVC Course Offerings

### SCIENCE

#### Honors Forensic Science (fall and spring)

##### **PowerSchool Code- 30205X0**

This course focuses on the application of basic biological, chemical and physical science principles and technological practices to the purposes of justice in the study of forensic science as it relates to judicial and civil issues. The class is designed around authentic performance assessments with students working in teams to solve crimes using scientific knowledge and reasoning. Through lab work, students will apply inference and deductive reasoning to the investigation and potential solving of crimes. It involves all areas of science including biology, anatomy, chemistry, physics, and earth science with an emphasis in complex reasoning and critical thinking. In addition, students must incorporate the use of technology, communication skills, language arts, art, family and consumer science, mathematics and social studies. This course requires the ability to write clear and concise lab and investigative reports. Good writing skills are imperative. This course also deals with graphic content. Parents are asked to sign a permission slip at the beginning of the course, but students are expected to be mature when dealing with this content.

##### **Prerequisites or Suggested Skills**

Completion of Language Arts/ English with a grade of "A", completion of Biology I, completion of Math III, and completion of a Placement Exam with a score of 70 or above. NCSSM will provide a placement test to be administered by the school at the time of registration.

##### **Grade Level:** 10-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: 919-416-2640 fax: 919-416-2650 [davisc@ncssm.edu](mailto:davisc@ncssm.edu).

**Textbook:** Must be provided by the school

Forensic Science: Fundamentals and Investigations, by Bertino and Bertino (2nd Edition) Published by South-Western Educational: 2015. ISBN: 9781305077119

**Materials:** Some equipment will be provided on loan from NCSSM; schools are responsible for materials. A list of additional needed materials will be provided.

DISTANCE EDUCATION & EXTENDED PROGRAMS

<http://www.ncssm.edu/for-educators/nc-public-schools>

**Site Requirements:** Facilitator assistance will be required to set up labs and proctor assessments. Instructor will provide a list of educational websites that students must be able to access during class, including but not limited to Google Drive and [www.firearmsid.com](http://www.firearmsid.com)

## **Honors Genetics and Biotechnology (fall and spring)**

### **PowerSchool Code- 33605X0**

What do crime scene investigations, agriculture, medicine, conservation biology and manufacturing have in common? They have all been revolutionized by biotechnology! Almost every day we read about new developments in the rapidly changing fields of genetics and DNA-based biotechnology. In this course, students will first explore classical genetics and then move onto examining the structure and function of DNA and proteins. With state-of-the-art laboratory experiments, students will analyze DNA fingerprints from a crime scene, genetically transform bacteria and investigate their own DNA! Finally, they will survey the applications of biotechnology in many diverse fields and discuss in depth how biotechnology is changing our daily lives and our future. With the decline of traditional manufacturing in North Carolina, biotechnology is positioned to become a vital part of North Carolina's 21st century economy.

### **Prerequisites or Suggested Skills**

Completion of Biology I with a B or higher and completion of Math III

### **Grade Level:** 9-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: 919-416-2640 fax: 919-416-2650 [davisc@ncssm.edu](mailto:davisc@ncssm.edu).

**Textbook:** Must be provided by the school

Essential Genetics: A Genomics Perspective by Daniel L. Hartl Jones and Bartlett Press 4th or 5th edition ISBN: 0763773646 | ISBN 13: 9780763773649

**Site requirements:** Students must have computer access to the Internet in the classroom. Facilitator assistance will be required to set up labs.

## **Honors Physics (fall and spring)**

### **PowerSchool Code- 34305X0**

This course is a hands-on, inquiry based introductory course which combines both “conceptual” and “mathematical” approaches to learning physics. The course covers mechanics (Newton’s laws of motion and their applications) and will potentially include waves, electricity, and optics. Students will learn to solve real problems by investigating real systems. Investigations will cover physics topics that are fun and engaging for the students. Students will design experiments, use accurate measuring equipment and construct and test conclusions based on accurate data.

### **Prerequisite or Suggested Skills**

Completion of Math III with a C or higher

### **Grade Level:** 10-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: 919-416-2640 fax: 919-416-2650 davis@ncssm.edu

**Materials:** Each student must have a graphing calculator (TI-83, TI-84 or TI-89) that they may take home.

**Textbook:** Must be provided by the school

Conceptual Physics, by Paul G. Hewitt Prentice Hall ISBN-10: 0-13-364749-8 | ISBN-13: 978-0-13-364749-5

**Site Requirements:** Students must have computer access to Internet in classroom

## **Honors Public Health Topics (spring)**

### **PowerSchool Code- 60195X0**

This course provides an introduction to a range of topics and issues in public health with an emphasis on global public health. Some possible topics of discussion include the health and welfare of women and children in low-income countries, the impact of emerging and re-emerging infectious diseases across the globe, food insecurity and malnutrition, demographic transition and immigration, global fertility and mortality, the stigma of mental health, and occupational health. This course will also address a number of impactful case studies and controversies in health and biomedical ethics.

DISTANCE EDUCATION & EXTENDED PROGRAMS

<http://www.ncssm.edu/for-educators/nc-public-schools>

As public health relies on a number of systems in order to serve diverse populations across the globe, this course will take a systems thinking and modeling approach, using authentic performance assessments with students working in teams to apply concepts learned throughout the term. This interdisciplinary course requires complex reasoning and critical thinking skills, extensive use of technology, communication and problem-solving skills. Strong writing skills are imperative.

**Prerequisites or Suggested Skills**

Completion of Language Arts/ English with a grade of "A".

**Grade Level:** 10-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: [919-416-2640](tel:919-416-2640) fax: [919-416-2650](tel:919-416-2650) [davisc@ncssm.edu](mailto:davisc@ncssm.edu).

**Textbook:** To be released later in the Spring. Must be provided by the school

**Materials:** Some equipment will be provided on loan from NCSSM; schools are responsible for materials. A list of additional needed materials will be provided.

**Site Requirements:** Facilitator assistance will be required to set up labs and proctor assessments. Instructor will provide a list of educational websites that students must be able to access during class, including but not limited to Google Drive.

## ENGINEERING & TECHNOLOGY

### **Honors Aerospace Engineering- (fall and spring)**

#### **PowerSchool Code- 34055X0**

This course introduces students to the field of aerospace engineering, engineering design, and the core math and science concepts needed to solve problems related to aerospace and other engineering disciplines. The course is presented with historical context, emphasizing the development of human flight from antiquity through modern aviation and on into current and future exploration of space.

Topics include spatial reasoning, properties of fluids, descriptions of 3-dimensional motion, the mechanics of flight, and basic aero- and thermodynamic principles applied to the design and control of aircraft and spacecraft. Students have opportunities to experiment, calculate, compute, design and build as they explore and solve problems associated with the mechanics of flight, and are encouraged to earn course credit through aerospace-themed projects of their own design.

#### **Prerequisites or Suggested Skills**

Completion of Math III or Integrated Math III with a B or higher. Students should be able to relate lengths of sides of a triangle to angles using trigonometry.

**Grade Level:** 10-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: 919-416-2640 fax: 919-416-2650 davis@ncssm.edu

**Materials:** Some equipment on loan from NCSSM; schools are responsible for materials. A list of additional needed materials will be provided. Some free software must be downloaded and installed on all student machines.

**Site requirements:** Students must have computer access to the Internet in the classroom. Google Chromebooks are less preferred as there are incompatibilities with some class software. Facilitator assistance will be required to set up labs.



## **Honors Connected Computing: Solving Global Challenges with Code (fall)**

**PowerSchool Code- 28005X0**

In this applied computer science course students will use sensors and portable computers (Raspberry Pi boards and Arduinos) to design wearable technologies and use computer code, including Python, to control them and manipulate the data they generate. There will be an emphasis on solving societal problems with current technologies throughout the course, and we will meet several pioneers in person to interview them alongside our own work. A portion of the class will be dedicated to health and wellness applications using wearable technologies and another portion of the class will be dedicated to animal perception experiences that increase awareness of conservation issues and empathy for global management of environmental resources. Students will gain experience in creating circuits, building wearable devices, and applying design processes to their creations that use computational thinking strategies along with coding to make the devices functional. Students that enjoy project based learning and want to use technology to make the world a better place will find their niche here!

### **Prerequisites or Suggested Skills:**

None

**Grade Level:** 10-12

**Consumables Fees:** A \$25 per student consumable materials fee will be invoiced at the start of the semester. For inquiries regarding invoices, please contact Crystal Davis at NCSSM. phone: [919-416-2640](tel:919-416-2640) fax: [919-416-2650](tel:919-416-2650) [davisc@ncssm.edu](mailto:davisc@ncssm.edu).

**Textbooks:** Must be provided by the school; TEXTBOOKS LIST TBD

**Materials:** Some equipment will be provided on loan from NCSSM; schools are responsible for materials. A list of additional needed materials will be provided.

**Site Requirements:** Facilitator assistance will be required to set up labs and proctor assessments. Instructor will provide a list of educational websites that students must be able to access during class, including but not limited to Google Drive. Please note that students may be accessing \*gaming sites\* that may normally be blocked by school computers. The site document will list specifically what students need to see.

## **Honors Cryptography & Computer Programming (fall and spring)**

### **PowerSchool Code- 28005X0**

This course introduces students to cryptographic methods used to encipher and decipher secret messages with an emphasis on using computer programming to automate the process. Through class discussions, problem solving, group activities, and programming assignments, students will learn a variety of encryption schemes ranging from the age of Caesar to modern public key encryption used to secure digital communications online. Students will learn introductory number theory and statistics to describe these methods and identify weaknesses that allow secret messages to be read without the key. Students will also master programming topics such as variables, functions, conditional logic, looping and recursion, and file input/output in the Python language to implement each cryptographic method. This course will utilize a blended learning environment with large portions of material being taught online and utilizing in class time for working in groups.

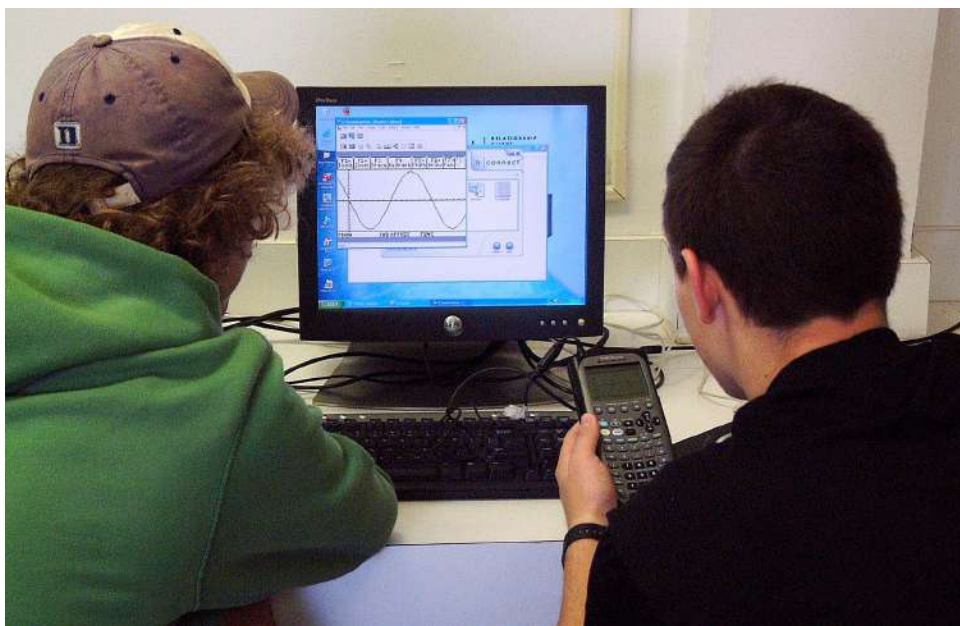
### **Prerequisites or Suggested Skills**

TDB

**Grade Level:** 10-12

**Textbook:** B or better in Math II Honors, or an A in Math II

**Site requirements:** Students must have computer access to the Internet in the classroom.



## **BLENDED**

This blended course provides a synchronous and asynchronous experience. This course meets one day a week via video-conferencing through Zoom software. All other content is delivered online (asynchronously) through Canvas, a mobile-friendly learning management system adopted by UNC campuses and North Carolina Public Schools.

### **Honors Introduction to Computer Science Principles- CS400 (fall)**

**PowerSchool Code-30205X0**

### **AP Computer Science Principles- CS408 (spring)**

**PowerSchool Code- 0A027X0**

This two-course sequence is for creating educated and productive citizens who are able to thrive in a world where computing is changing how we live and think. Unlike traditional computer science courses, writing code is deemphasized in favor of innovation, impact, and an understanding of how computing is woven into the fabric of everything that we do. Topics include algorithms, networks, crowd-sourcing, internet form and function, and big data concepts such as genomic/person-specific medicine.

#### **Prerequisites or Suggested Skills**

B or better in Math II Honors, or an A in Math II.

**Grade Level:** 11-12

**Textbook:** None

**Site requirements:** Students must have a laptop computer with built in camera, headset microphone or earbuds, and access to the Internet in the classroom. Chromebooks will not work for this course.

## MATHEMATICS

### Honors Applications of Mathematics (spring)

**PowerSchool Code- 28002X0**

**Course Description:** Applied Finite Mathematics offers an overview of a number of applications of mathematics, including the social, management and biological sciences. The major topics covered in this course are those often included in a high school Discrete Mathematics or Finite Mathematics course. Applications and modeling are central to the course, and topics include fair division, voting methods, apportionment, graph theory, networks and recursive systems. This course also extends your knowledge of matrices and their use in applications, as well as probability and univariate data analysis. Students will frequently engage in collaborative group work and build their skills in communicating their thinking through mathematics and in writing.

#### **Prerequisites or Suggested Skills**

Completion of Math III Honors or equivalent with a grade of B+ or higher.

**Grade Level:** 11-12

**Textbook:** Must be provided by the school

Excursions in Modern Mathematics (9th edition) Pearson, 2017

**ISBN-13:** 978-0134468372

**Materials:** Some equipment will be provided on loan from NCSSM; schools are responsible for materials. A list of additional needed materials will be provided. (The course is taught from the perspective of the TI-84 or 84 Plus and so these calculators are preferred; TI-83 or 83 Plus, TI- Inspire, or TI-89 are acceptable). Site requirements: Students must have computer access to the Internet in the classroom.

## **Honors Calculus/AP Calculus AB Course (two-course sequence)**

### **Honors Calculus (fall)**

**PowerSchool Code- 28005X0**

This course is rich in technology and applications, and prepares students for the AP Calculus AB Exam. AP Calculus develops the student's understanding of the concepts of the Calculus (functions, graphs, limits, derivatives) and provides experience with methods and applications. The course encourages the geometric, numerical, analytical, and verbal expression of concepts, results, and problems. Prerequisite Completion of Precalculus with an "A" and the recommendation of the math teacher. Students should have a strong background in algebra and functions, including polynomial, exponential, logarithmic, and trigonometric. Students should also have knowledge of basic graphing calculator functions ... graphing an equation, determining a Window, use of the built-in Intersect, Maximum, Minimum, Zero, & Value functions. A summer assignment will be sent to enrolled students. The completion of the summer assignment is mandatory. Schools will be asked to supply the following student information: PSAT scores- both Verbal and Mathematical and ACT scores.

**Grade Level:** 10-12

**Prerequisite:** Completion of Pre-Calculus (or equivalent) with a grade of B+ or higher

**Materials:** Each student must have a graphing calculator that they may take home. (The course is taught from the perspective of the TI-84 or 84 Plus and so these calculators are preferred; TI-83 or 83 Plus, TI-Inspire, or TI-89 are acceptable).

**Textbook:** Must be provided by the school

Calculus, Early Transcendentals: Single Variable, By Howard Anton, Irl Bivens, and Stephen Davis Publisher: John Wiley and Sons, Inc., 2012 10th Edition ISBN. 978-0-470-64768-4

**Site requirements:** Students must have computer access to the Internet in the classroom.

## **AP Calculus AB (spring)**

### **PowerSchool Code- 2A007X0**

The second half of the two-course sequence, AP Calculus continues to develop the student's understanding of these concepts of the Calculus (functions, graphs, and integrals) and provides experience with methods and applications.

With the course curriculum established by The College Board, the course is to be representative of college-level mathematics. The course continues to encourage the geometric, numerical, analytical, and verbal expression of concepts, results, and problems. The semester's work includes ongoing review of the first semester topics and preparation for the AP exam.

### **Prerequisite or Suggested Skills**

Successful completion of the NCSSM Honors Calculus course, offered in the fall semester. Schools will be asked to supply the following student information: PSAT scores- both Verbal and Mathematical and ACT scores.

**Grade Level:** 10-12

**Materials:** See requirements for Honors Calculus

**Textbook:** Must be provided by the school

Calculus, Early Transcendentals: Single Variable, By Howard Anton, Irl Bivens, and Stephen Davis Publisher: John Wiley and Sons, Inc., 2012 10th Edition ISBN. 978-0-470-64768-4

**Site requirements:** Students must have computer access to the Internet in the classroom.



## **Honors Statistics/AP Statistics (two-course sequence)**

### **Honors Statistics (fall)**

**PowerSchool Code- 28005X0**

This first part of a year-long course covers the content of a typical introductory college course in Statistics. In colleges and universities, the number of students who take a Statistics course is almost as large as the number of students who take a Calculus course. (At least one Statistics course is typically required for majors such as engineering, psychology, sociology, health science, mathematics, and business.)

The first semester will provide an overview and introduction to Descriptive Statistics, and will introduce students to the major concepts and the tools for collecting, analyzing, and drawing conclusions from data. The completion of the summer assignment is mandatory.

**Prerequisite:** Students must have completed a course beyond Math III with a B average or better and have strong algebra skills.

They must also possess strong verbal skills as well as sufficient mathematical maturity and quantitative reasoning ability. A summer assignment will be sent to enrolled students. The completion of the summer assignment is mandatory. Schools will be asked to supply the following student information: PSAT scores- both Verbal and Mathematical and ACT scores.

**Grade Level:** 10-12

**Materials:** Each student must have a graphing calculator that they may take home. (The course is taught from the perspective of the TI-84 or 84 Plus and so these calculators are preferred; TI-83 or 83 Plus or TI-Inspire are acceptable)

**Textbook:** Must be provided by the school

The Practice of Statistics Third Edition (2008), by Daren S. Starnes, The Lawrenceville School; Dan Yates, Statistics Consultant; David S. Moore, Purdue University published by Bedford Freeman and Worth, ISBN-13: 978-0-7167-7309-2 ISBN-10: 0-7167-7309-0

\*Barron's AP Statistics, 6th Edition ISBN-10: 0764147021

**Site requirements:** Students must have computer access to the Internet in the classroom.

## **AP Statistics (spring)**

**PowerSchool Code- 2A037X0**

The second half of the two-course sequence, AP Statistics covers the methods of Inferential Statistics, and will introduce students to the major concepts of hypothesis testing and confidence intervals. With the course curriculum established by The College Board, the course is to be representative of college-level mathematics. The semester's work includes ongoing review of the first semester topics and preparation for the AP exam.

### **Prerequisite or Suggested Skills:**

Successful completion of the NCSSM Honors Statistics course, offered in the fall. Schools will be asked to supply the following student information: PSAT scores- both Verbal and Mathematical and ACT scores.

**Grade Level:** 10-12

**Materials:** See Honors Statistics

**Textbooks:** See Honors Statistics

**Site requirements:** Students must have computer access to the Internet in the classroom.

## HUMANITIES

### Honors African American Studies (fall and spring)

#### PowerSchool Code- 46015X0

This interdisciplinary course provides an introduction to African American history, literature, and culture. Students examine significant social, political, economic, and religious issues as well as issues of identity in the lives of African Americans from the sixteenth to the present. In addition to primary and secondary source readings, students explore texts ranging from slave narratives, folktales, and spirituals to the works of past and contemporary writers, artists, musicians, and filmmakers. Through a variety of assignments and activities, students continue to develop their skills in reading, speaking, and research, with special emphasis on the writing Process.

#### Prerequisites or Suggested Skills

None

#### Grade Level: 10-12

**Textbook:** There is no required textbook. The schools will have to provide students access to the following websites:

- National Archives – Black History:  
<https://www.archives.gov/research/alic/reference/black-history-topical.html#slavery>
- Digital Schomburg: African American Women Writers of the 19<sup>th</sup> century -  
[http://digital.nypl.org/schomburg/writers\\_aa19/toc.html](http://digital.nypl.org/schomburg/writers_aa19/toc.html)
- Africans in America (PBS), 1450-1865 -  
<http://www.pbs.org/wgbh/aia/home.html>
- Flashbacks: African American Education (The Atlantic Magazine) -  
<https://www.theatlantic.com/past/docs/unbound/flashbks/blacked/aaedintr.htm>
- Flashbacks: Black History, American History -  
<https://www.theatlantic.com/past/docs/unbound/flashbks/black/blahisin.htm>
- The HistoryMakers: The Nation's Largest African American Video Oral History Collection - <http://www.thehistorymakers.org/>
- The Faces of Science: African Americans in the Sciences -  
<https://webfiles.uci.edu/mcbrown/display/faces.html#Present>

- Great Black Heroes - <http://www.greatblackheroes.com/>
- Africans in America - <http://www.pbs.org/wgbh/aia/>
- The African American Mosaic - <https://www.loc.gov/exhibits/african/>
- This Far By Faith - <http://www.pbs.org/thisfarbyfaith/>
- African American Registry - <https://aaregistry.org/>

**Site requirements:** Students must have computer access to the Internet in the classroom.



## **STEM ENRICHMENTS FOR ELEMENTARY AND MIDDLE GRADES STUDENTS**

### **How It Works**

STEM Enrichment sessions enhance core instruction for Elementary and Middle school students as well as provides resources for teachers in “hard to teach” concepts. Instruction is aligned with the competencies and objectives outlined nationally and by the state of North Carolina. NCSSM offers both live interactive programming and do-it-yourself lessons.

Synchronous sessions are scheduled interactive opportunities that supplement classroom curriculum with hands-on activities. Schools must have either a Polycom, Tandberg hardware or video-conferencing software, camera and a microphone; or simply a computer, strong internet connection, a web camera, and microphone in order to schedule live video-conferencing sessions with NCSSM. NCSSM does not use Skype or Google Hangouts for enrichment sessions.

For more information on live and do-it-yourself enrichments, visit us at <https://www.ncssm.edu/stemenrichments>. To schedule live enrichments, contact Crystal Woods: woods@ncssm.edu or (919) 416-2643.

### **Synchronous Enrichment Sessions**

#### **M&M Counting Fun Grades K-1 Math**

Students will learn how to count and graph, and reinforce their knowledge of basic colors. The student counts up to 10 or more objects using verbal names and one-to-one correspondence, as well as uses sets of M&Ms to represent quantities given in verbal or written form.

#### **Balance & Motion Grades 1-2 Science**

Students will have a basic understanding of the concepts of gravity and symmetry by exploring balanced and unbalanced systems. They will also discover ways to manipulate the center of mass of an object.

#### **Exploring Sound Grades 1-3 Science**

Students will have a basic understanding of the heart and the circulatory system by making an artificial heart out of everyday household materials.

### **Multiplication Station Grade 3 Math**

Students will interpret products of a whole number as the number of objects in each group. Students will use dominos to practice interpretation of multiplication.

### **Solid, Liquid, Gas Grades 3-5 Science**

The students will learn about three different states of matter (solids, liquids and gases/gasses) and the concept of mass. The hands-on activities involve bagging matter, saturating solutions and creating and observing a chemical overreaction.

### **Area, Perimeter, Circumference Grades 3-4 Math**

Students will learn to calculate the area and perimeter of rectangles and determine the circumference and area of circles.

### **Sherlock Holmes Grades 3-4 Science**

The students will learn observation, memory, and critical thinking skills. Students will understand how useful observation and memory skills are in real life situations and the importance of written records. They will also talk about hard evidence that detectives use, fingerprint types, and see their own fingerprints.

### **Estimation Station Grades 3-4 Math**

Students will have a basic understanding of reasonable estimation using hands on experiments. Students will also refresh addition and subtraction skills.

### **Genetics: DNA Grades 3-4 Science**

Students will learn about genetics and DNA. Students will gain a basic understanding of the application and function of DNA.

### **Fractions & M&Ms Grades 3-5 Math**

In this session, students will learn the concept of fractions, numerators, denominators, and ratios.

### **Hydrodynamics Grades 3-5 Science**

Students will understand the concepts of buoyancy and water displacement. Students will infer changes in speed and direction resulting from forces acting on an object and engineer a boat using the engineering design process.

### **Simple Circuits Grade 4 Science**

Students will construct parallel and series circuits and explain how each type of circuit works. Students will describe the qualities that define good and poor conductors of electricity and will list at least three of each type of conductor.



### **Magnetic Effects Grade 4 Science**

Students will investigate how and why magnetic compasses work. They will observe the forces exerted by magnets on each other and by magnets on iron objects. Students will learn how magnetic forces get weaker with distance and how these forces can be exerted through non-magnetic substance. Students will build a simple electromagnet to see how electric can be used to make a magnet.

### **Waiting For Heads Grade 4 Math**

Students will learn about decimals, fractions and percentages. Students will use dice to learn about whole numbers and fractions as well as convert fractions into percentages. They will gain a basic understanding of decimal placement.

### **Forces & Motion Grade 5 Science**

Students will have a basic understanding of force, inertia, friction, balanced forces, and unbalanced forces. They will build a vehicle that uses the force of air to move. After doing the activities in this video, students should have a basic understanding of force, inertia, friction, as well as balanced and unbalanced forces.

### **Decimal Bingo Grade 5 Math**

Students will use place value understanding to multiply decimals by whole numbers and decimals by decimals. Students will explore this concept using the game of bingo to enhance their learning.

### **Egyptian Math Grade 5 Math**

Students will learn a form of Egyptian mathematics to reinforce addition, subtraction, multiplication, and division techniques.

### **Water Cycle Grade 5 Science**

Students will gain a deeper understanding of the water cycle also known as the hydrologic cycle. Students will explore the three parts of the water cycle: evaporation, condensation, and precipitation.

### **Exponents Grades 5-6 Math**

Students will learn to translate products into exponents and exponents into products of the same factor.

### **Anatomy: The Digestive System Grades 5-7 Science**

Students will learn about the function of the digestive system, how it works, and which organs are involved in the digestive system.

### **Anatomy: The Kidney Grades 5-7 Science**

Students will learn about the functions of the kidney and discover forms of excretion from the kidneys such as sweat and exhalation. Students will also review the circulatory system.

### **Earth's Spheres Grades 5-7 Science**

Students will have a basic understanding of earth's systems. Students will understand how the four spheres/systems (biosphere, hydrosphere, geosphere and atmosphere) are interconnected.

### **Geometry: Surface Area & Volume 5-7 Math**

Students will have a basic understanding of Surface Area and Volume. Students will experience hands-on activities that focus on creating a hexaflexagon and discover how surface area and volume interact with each other.

### **Neuroscience: The Brain Grades 5-7 Science**

Students will learn about the anatomy and processes behind the nervous system, particularly focusing on the brain. Students will be familiar with brain function and its anatomy.

### **Neurons Grades 5-8 Science**

Students will learn about the different parts of neurons and how they work. Students will learn why neurons have their shape and how they connect with other neurons to form the nervous system.

### **Artificial Heart Grade 5-9 Biomedical Engineering**

The heart and circulatory system. Make an artificial heart out of everyday household materials.

### **Bones, Muscles, Joints Grades 5-9 Biomedical Engineering**

Students will have a basic understanding of the concepts of biomechanics. They will also understand how the human body uses its bones and muscles to create movement.

### **Breathing the Lungs Grades 5-9 Biomedical Engineering**

Students will have a basic understanding of the concepts of how the human lungs react to exhalation and inhalation, as well as the relationships between vital capacity, expiratory reserve, and tidal volume.

### **Earth's Temperatures Grades 5-9 Science**

Students will gain a basic understanding of climate and temperatures around the world. Students will predict approximate temperatures and compare different temperatures based on location. Students will understand factors that influence temperature in a particular region.

### **Genetic Diseases Grades 5-9 Science**

Students will have a basic understanding of genetics and an introduction to the three genetic diseases in relation to what they do, how they are caused, how they are treated and more.

### **Electromagnets Grade 5-9 Biomedical Engineering**

Students will have a basic understanding of the concept of electromagnets and their application in the real world. Students will also have an opportunity to build their own electromagnet.

### **Hydraulic Arm Grade 5-9 Biomedical Engineering**

Students will learn about the physiology and movements of the arm, as well as basic bioengineering principles. Students will engineer their own hydraulic arm to explore and test the concepts they learn.

### **Hydraulic Hand Grade 5-9 Biomedical Engineering**

Students will learn about biomedical engineering, prosthetics, and hydraulics. Students will learn the function and structure of prosthetics, how hydraulics work in artificial limbs and why they are used in the prosthetic hand. Students will also learn how hydraulics such as cars, pumps, and prosthetics are used in everyday life and use this to engineer a model hydraulic hand.

### **Low-Cost Stethoscope Grade 5-9 Biomedical Engineering**

Students will learn about biomedical engineering and how heart rates change under different conditions. Students will then engineer a low cost stethoscope.

### **Makey-Makey Computer Code Grade 5-9 Computer Science**

Students will find creative ways to interact with computers by using everyday objects as a replacement for keyboards and mice. Makey Makey will foster the student's ingenuity, bolster their creativity and spark their curiosity in technology.

### **Physics of Flight Grade 5-9 Engineering**

Students will learn about the dynamics of flight and the engineering design process. Students will apply the knowledge learned and teamwork to make an aircraft that will maintain flight for the longest period of time.

### **Compounds: Solubility Grade 6 Science**

Students will learn about compounds and the concepts of "like dissolves like" and will explore polarity by dissolving specific substances in water.

### **Food Chains & Food Webs Grade 6 Science**

Students will learn to construct a food chain and discover how energy flows through the chain. Students will explore how living organisms depend directly or indirectly on green plants for food and how each level is dependent on the other.

### **Fun With Cells Grade 6 Science**

Students will learn about the cell and the different parts of the cell. They will then create a model of a cell using everyday objects and develop an understanding of the cell and the different organelles within the cell through a hands-on method.

### **Mean, Median, Mode Grade 6 Math**

Students will be able to define and compute mean, median, mode, and range and be able to draw an accurate box-and-whisker plot.

### **Rolling Equations Grade 6 Math**

Students will write, read and evaluate expressions in which letters stand for numbers. Students will reinforce their understanding of this concept by creating expressions using dice and finding the solution.

### **Statistics & M&Ms Grade 6-7 Math, Math 1**

Students will learn how to describe data from M&Ms using range and various measures of central tendency including mean, median, and mode. Students will learn about the distinction between quantitative and qualitative data.

### **Periodic Table Grades 6-9 Science**

Students will learn how to read the periodic table, what it means, and to understand basic periodic trends. Students will explore a period, a family, the metals, nonmetals, metalloids, the alkali metals, the alkaline earth metals, the noble gases, and the lanthanide and actinide series.

### **Prosthetic Engineers Grades 6-9 Engineering**

Students will investigate biomedical engineering and the technology of prosthetics. Students create a model prosthetic lower leg using various materials. Each team demonstrates its prosthesis' strength and considers its pros and cons, giving insight into the characteristics and materials biomedical engineers consider in designing artificial limbs.

### **Electrons Grades 6-9 Science**

Students will learn about the electron, the nature of electrons, where they are found, and how they work.

### **Enzymes in the Body Grades 6-9 Science**

Students will learn basic information on enzymes and their role in life. Through several hands-on activities, students will discover the importance of enzymes and their reactions.

### **Enzymes: Rate of Reaction Grades 6-9 Science**

Students will learn about the function of enzymes and how temperature, concentration, time, and pH affect the rate of reaction. Students will analyze graphs and perform experiments to reinforce these concepts.

### **Force, Motion, & Air Resistance Grades 6-9 Science**

Students will learn and understand the effects of gravity, force, motion, air resistance, and terminal speed on the acceleration of a falling object.

### **Genetics: Population Grades 6-9 Science**

Students will have a basic understanding of various concepts associated with genetics and populations with various activities that introduce the effects environmental conditions can have on the genetic pool of a population. Students will gain a better understanding of the role certain genes play in the environment and vice versa.

### **Linear Equations Grade 6-8 Math**

Students will learn how to write an equation of a linear function when given a set of data. They will interpret the meaning of the slope and y-intercept and then use the equation to find other values of x and y. Students will be able to make sense of a set of data and plot it on a graph, find the equation of the line that contains the data points, understand the meaning of the slope and y-intercept, and use the equation to predict other x- and y-values.

### **Bits & Binary Grades 6-9 Computer Science**

Students will understand binary number systems and how they apply to computers and digital technology. Students will write numbers and letters in binary code, decode binary numbers, and develop an understanding of and be able to select and use information and communications technologies. Students will be able to understand scientific inquiry and understand the abilities of technological design. Students will learn how information and communication systems allow information to be transferred from human to human, human to machine, and machine to human.

### **Engineering Catapults Grade 6-9 Engineering**

Students will learn about the engineering design process, the design of catapults, and apply technological design steps to build a catapult that uses allocated materials to launch an object.

### **ECG Electrodes & COnsumables Grade 6-9 Biomedical Engineering**

Students will learn the roles of a biomedical engineer. They will gain a basic understanding of the use of ECG Electrodes and multimeters and build a low cost electrode.

### **Molecules 6-9 Science**

Students will have a basic understanding of elements, molecules, and compounds. Students will develop models of molecular structures to further their understanding of molecular science.

### **Dice & Randomness Grade 7 Mathematics**

The students will enjoy a hands-on determination of mathematical “facts,” followed by a discussion of the theory behind it. Students use a die to “compare” short-term randomness for obtaining a certain number versus long-term probabilities. Students “discover” that they are more likely to roll a seven than an eleven when playing Monopoly, and then talk about the probability behind it.

### **Microbes Grade 7 Science**

Students will learn the different types and characteristics of microbes. Students will explore bacteria, viruses, fungi, algae, and protozoa, and discover the variety of effects that they can have on humans.

### **Cells: Reproduction of Cells Grade 7-9 Science**

Students will learn about cellular reproduction and the steps of mitosis. Students will learn about checkpoints in the cell cycle and what happens when cell growth goes unchecked.

### **Equation Exploration Grade 8 Math**

Students will solve equations with one variable by transforming the given equation into simpler forms. Students will solve linear equations and piece together a puzzle based on the solution.

### **What’s Nano Grade 8 Math & Science**

Students will learn about nanotechnology and nanoscience. Students will use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

### **Finding Fibonacci Math I Grade 8-9 Math**

Students will have a basic understanding of the Fibonacci Sequence and how it is present in nature. Students will learn how to draw fibonacci diagrams.

## **Do-It-Yourself Enrichment Sessions**

### **Balance and Motion - Grades 1-2 Science**

Students will have a basic understanding of the concepts of gravity and symmetry by exploring balanced and unbalanced systems. They will also discover ways to manipulate the center of mass of an object.

### **Who Says I Can't Be Sherlock Holmes - Grades 2-4 Science**

The student will learn observation, memory, and critical thinking skills. Students will understand how useful observation and memory skills are in real life situations and the importance of written records. They will also talk about hard evidence that detectives use, fingerprint types, and see their own fingerprints.

### **Solid, Liquid, Gas - Grades 3-4 Science**

The student will learn about three different states of matter (solids, liquids and gases) and the concept of mass. The hands-on activities involve bagging matter, saturating solutions and creating and observing a chemical overreaction.

### **Magnetic Effects - Grade 4 Science**

Students will follow along with several demonstrations and do a hands-on activity. They will also answer several questions during the course of the video. These demonstrations involve an investigation of how and why magnetic compasses work. They will observe the forces exerted by magnets on each other and by magnets on iron objects; as well as how magnetic forces get weaker with distance and how these forces can be exerted through non-magnetic substances. Finally, they will build a simple electromagnet to see how electricity can be used to make a magnet.

### **Forces in Motion - Grades 4-5 Science**

Students will have a basic understanding of force, inertia, friction, balanced forces, and unbalanced forces. They will build a vehicle that uses the force of air to move. After doing the activities in this video, students should have a basic understanding of force, inertia, friction, as well as balanced and unbalanced forces.

### **Box Problem Level 1 Grades 5-7 Math**

Suppose you have a rectangular piece of cardboard that you want to use to make a box for storing marbles. You will make the box by cutting squares from the corners of the cardboard and then fold up the edges. The box will have no top. What size squares should you cut to make the box with the largest volume? Calculators will be needed for computation.

### **Box Problem Level 2 Grades 8-9 Math**

Suppose you have a rectangular piece of cardboard that you want to use to make a box for storing marbles. You will make the box by cutting squares from the corners of the cardboard and then fold up the edges. The box will have no top. What size squares should you cut to make the box with the largest volume? Students will investigate this problem using physical models, tables, and graphs. Students will be guided to define a variable representing the size of the square and to write a function for the box volume. Graphing TI-83+ calculators are required to create a table with more values and to graph the function.

### **Box Problem Level 3 Grades 10-11 Math**

Students build open top rectangular boxes from a standard sheet of paper by cutting congruent squares from each corner. Data is collected that pairs the length of the side of the cut out square with the volume of the resulting box to create a scatter plot. Students will be guided to define a variable representing the size of the square and to write a function for the box volume. Students learn to describe a clear pattern shown in the scatter plot, and develop a function through analysis of the box design. Based on this function, the length of the side of the square is determined to create a box of maximum volume, and two squares that will produce a box of equal volume. Students will investigate this problem using physical models, tables, and graphs. Graphing TI-83+ calculators are required to create a table with more values and to graph the function.



## SUMMER ACCELERATOR

### About Summer Accelerator

North Carolina School of Science and Mathematics' Summer Accelerator program extends to a global audience our 30 years of experience offering innovative courses and opportunities to talented students. There are two divisions within Summer Accelerator: one week long residential programs for rising 7th through 9th graders called Early Accelerator and three week long online and residential blended programs for rising 10th through 12th graders called Accelerator. In each section, students apply to a specific course.

All Accelerator and Early Accelerator courses are designed to provide students from across the globe the opportunity to come together in diverse groups to live and learn together while gaining hands-on experience with intriguing topics in science, technology, engineering and math.

In Summer Accelerator courses, highly skilled faculty focus their talents on building upon the strengths of high-achieving students in advanced science and math topics in the classroom. Student Life Instructors offer a valuable resource and help provide a safe and enjoyable residential experience for students out of the classroom. NCSSM crafts unique high-level academic experiences in a setting designed specifically for students in grades 7 through 12.

### **Schedule**

Each Accelerator courses consist of one week of on-site work on NCSSM's campus or the Brevard College campus. Accelerator courses for rising 10th, 11th and 12th graders are supplemented with two weeks of online work prior to their week onsite (see individual course descriptions for specifics of each class, as exact dates may vary). The online materials introduce, enrich, and expand upon the face-to-face learning that happens on campus.

*In 2018 we will offer two sessions on the campus of Brevard College. Brevard is located in the Western North Carolina and the private school campus is not unlike our own in Durham. It houses the same number of students during the school year and is isolated in the hills of the Smoky Mountains. Our faculty and summer staff will conduct the same program in Brevard while utilizing the surrounding natural resources as well as the Pisgah Astronomical Research Institute (PARI).*

This combination of learning experiences has proven successful at NCSSM for STEM education, and distinguishes the Summer Accelerator program from most other programs currently offered for exceptional students. Early Accelerator courses for rising 7th, 8th, and 9th graders do not include the online portion.

#### *Online Preparation (for Accelerator courses only)*

Online content typically requires students to complete 15 hours of work during the two weeks before the on-campus portion of the course.

This time includes:

- Time for students to introduce themselves and share common interests (which can help build the cohort before they arrive on campus).
- Time for course readings.
- Time for interactive discussions.
- Time to view video content.
- Time to complete reflection questions.
- Time for inquiry and/or data collection.

Exact requirements vary by course. Some instructors require the group to virtually meet-up at a designated time during the week, while others have their students work entirely independently.

#### **Evenings and Weekends**

Students have the opportunity to choose from a variety of enrichment activities while in residence at NCSSM / Brevard College. These may include visits to local museums, information and demo sessions on cutting-edge technologies such as 3D printing and virtual reality, Durham Bulls baseball games, guest speakers, outdoor movie nights (often featuring films with content related to course concepts), trips to local restaurants, and organized and informal athletic events. We pride ourselves on offering a variety of activities from which to choose every evening; providing a structure where students are free to create their own schedule.

#### **Requirements**

We accept students who excel in the areas of science, technology, engineering and mathematics. We do not have a specific GPA requirement. The committee that reviews the applications looks at a number of factors to ensure they will be able to succeed in the rigorous course in which they are applying. Each course has different specific prerequisites, such as Math II or Biology. Please check the course listings for course requirements. Every student is required to fill out the online application, including essays, in order to be considered for the program.

## **Admissions**

Accelerator and Early Accelerator courses are for exceptional rising 7th through 12th graders. Any student who meets the requirements for the course for which they are applying may apply to that Summer Accelerator course. Applicants do not have to be residents of North Carolina. Students from all over the globe are encouraged to apply. There is no deadline for applications submitted by the general public. Applications are accepted for each course until the course is full, at which time we begin a wait-list. You do have the chance to fill in a second choice in case your first choice is full.

Applications for Summer 2018 will be accepted beginning December 1, 2017. Students who apply will be notified regarding their acceptance two weeks after they submit their application. Space in each course is limited, so participants are encouraged to apply early. Once accepted into the program, a non-refundable deposit of \$250 is due within seven days to reserve a spot. Programs range in cost from \$1,425 to \$1,925.

As part of our mission to provide students registered in our two-year Online Program with more exposure to the school's Faculty, we offer 80 scholarship awards to NCSSM Online Program students that can be applied to Summer Accelerator or Summer Online courses (see schedules linked below). NCSSM Online students must apply during the application window of April 15th to May 1st, 2018 and will be notified of their acceptance by May 7th, 2018.

For more information, and to apply, visit: <http://www.ncssm.edu/accelerator>

## **Financial Aid**

Any student in the United States who has been accepted to the Summer Accelerator program may apply for financial aid by completing a FACTS Aid Assessment for a \$30 fee. FACTS assessment fees for North Carolina students who are eligible for reduced-price meals in the National School Lunch Program will be paid by Accelerator. Students in North Carolina whose families are eligible for the Supplemental Nutrition Assistance Program and/or free meals in the National School Lunch Program may apply for a full financial aid scholarship for our summer programs without doing the FACTS assessment.

We will award financial aid to at least ten eligible students in 2018. To apply for aid, please fill out the same application and indicate that you are applying for aid. Once accepted to Summer Accelerator, we will provide details about applying for financial aid.

At that point, applicants can choose to complete the FACTS assessment to apply for financial aid or send proof of SNAP or free/reduced-price meals to [summer@ncssm.edu](mailto:summer@ncssm.edu) in order to be considered for aid. The student's spot will be held without a deposit during the financial aid application process, and a deposit will be due one week after the assessment depending on aid amount.

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## **Early Accelerator Program Courses and Dates** (rising 7th - 9th grade)

### **Durham Campus**

**June 17 - 22:** Creative Digital Fabrication | Solar Physics | Epidemiology

**June 24 - 29:** Creative Digital Fabrication | Math Puzzles & Games | Epidemiology

**July 15 - 20:** Young Builders' Guild | Genetics | Solving Problems with New Math

**July 22 - 27:** Young Builders' Guild | Anthropology | Ecological Research | Breaking Reality: How Games Might Change the World

### **Brevard Campus**

**June 17 - 22:** Solving Problems with New Math | Investigative Science

**June 24 - 29:** Big History: Big Bang to Anthropocene | Prove It

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## **2018 Courses Eligible for an Online Award**

### **Blended Online + Residential Accelerator Courses** (rising 10th - 12th grade)

#### **Durham Campus**

**May 28 - June 8, June 10 - 15 on campus:** Neuroscience | Makeup of Matter | Programming | Sound Design & Subtractive Synthesis

**July 3 - 14 online; July 16 - 21 on campus:** Advanced Cloning Lab | Cryptography | Epigenetics | Breaking Reality: Utility of Games | Game Design & Programming | Rocketry

#### **Brevard Campus**

**June 4 - 15 online, June 17 - 22 on campus:** Radio Telescope Astronomy | Stars, Storms, & Simulation

**June 11 - 22 online, June 24 - 29 on campus:** Makeup of Matter | MINDSET: Math for Decision-Making

DISTANCE EDUCATION & EXTENDED PROGRAMS

<http://www.ncssm.edu/for-educators/nc-public-schools>

## **Online Courses** (rising 10th - 12th grade)

Summer Online courses take place entirely online with some synchronous meeting times each week. Each schedule varies depending on the course. Students should expect to dedicate approximately 20 hours to coursework each week.

**June 12 - June 30:** Physics of Current Events | Exploration in Biomedical Engineering

**July 10 - July 28:** Modern Physics or Quantum Mechanics | Introduction to Astronomy | Anthropology: The Science of Being Human

## **QUICK LINKS**

**IVC Enrollment Forms:** <https://www.ncssm.edu/ivc-courses>

**NCSSM Online:** <http://online.ncssm.edu/>

**NCSSM Online Program—Application for Enrollment:**

<http://www.ncssm.edu/online-program/academics/admissions>

**Accelerator:** <https://www.ncssm.edu/summer-programs/accelerator>

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