SPRING 2016 STEM INSTITUTE

The NYC Department of Education is committed to working with school leaders and teachers to build their capacity in, and develop a shared understanding of, high quality STEM education. The STEM Institutes serve to provide professional learning opportunities to schools in their efforts to identify and develop a STEM focused approach to learning that supports student achievement. With generous support from the GE Foundation and CS4All partners, the NYCDOE is excited to offer the third STEM Institute, for teacher teams of 2 to 3 educators.

During the three-day Spring STEM Institute, which will take place from Tuesday, April 26th to Thursday, April 28th, 2016, teacher teams will have an opportunity to:

- Develop a shared understanding of the important features of STEM and computer science education
- Develop an awareness of approaches to STEM and computer science education
- Build their leadership capacity to support STEM and computer science education within their school communities
- Begin to build partnerships with other schools with similar interests to support your STEM and computer science initiative

Offerings will include hands-on, interactive sessions in robotics, computer science, urban gardening, engineering, solar energy, design thinking and more. Teachers and eligible supervisors who attend the full Institute will receive 15 hours of per session. Eligible teachers should review Vacancy Circular # 451. Eligible supervisors should review Vacancy Circular # 452.

Please note: As this is a paid professional development opportunity and we do not offer childcare, we ask that you please do not bring children to the Institute.

Registration Closes: April 8th, 2016

NOTE: You will initially receive confirmation of your online registration when it is complete. Confirmation of your acceptance in the program will occur after we have received your principal’s approval of your attendance in this program.
STEM INSTITUTE TRACKS

STEM (ST) TRACK SESSIONS
The professional learning opportunities with a course number beginning with ST encompass three days of training at the Spring STEM Institute. By selecting one of these sessions you are committing to attending the full professional learning offering at the Spring STEM Institute on April 26th through the 28th. If you register for a ST track offering you will have the opportunity to register for a different session at the Summer STEM Institute in July, if you choose to attend.

COMPUTER SCIENCE (CS) TRACK SESSIONS
The professional learning opportunities with a course number beginning with CS encompass six days of training at the Spring and Summer 2016 STEM Institutes. By selecting one of these sessions you are committing to attending the full professional learning offering at the Spring STEM Institute on April 26th through the 28th AND the Summer STEM Institute on July 12th through July 14th. If you register for a CS track offering you will NOT have the opportunity to register for a different session at the Summer STEM Institute in July and will be automatically enrolled in your existing session. Please do not sign up for a CS Track session if you are unable to attend the full six days (Spring and Summer 2016 Institutes) of professional development.

Instructions to register for CS and ST track:

- Review the breakout descriptions and decide which one your teacher team will attend. Teacher teams should attend the same session.
- Please register up to 3 teachers and administrators for the Institute. You are also able to register up to 1 administrator for the plenary session only.
- Please make sure your principal approves your participation in the Institute as we will reach out to confirm your attendance.

LEADERSHIP (APL) TRACK SESSION WITH APPLE EDUCATION
This year we are offering a special track for principals who wish to develop or enhance their vision of how technology will expand what’s possible for learning. This session will use Challenge Based Learning, an engaging, multidisciplinary problem-solving approach. Principals will identify initiative goals, explore a model for managing change, and develop a plan for ongoing engagement and measuring effectiveness. Registration is limited and open only to principals.

Instructions to register for the APL track:

- Review the breakout session description, including dates of the institute. By registering for this institute, you commit to attend all 3 days of the institute.
STEM (ST) TRACK SESSIONS – These offerings are available at the Spring Institute ONLY

**ST01 - Advanced EV3 Mindstorms Programming (Grade: 6 to 8)**
Robotics is an engaging vehicle to help students develop engineering skills and engage in STEM. This is a **Level 2** session for those who have participated in prior FIRST LEGO League Robotics Training. The session continues to explore and take EV3 programming to the next level. **SPECIAL REQUIREMENT:** Participants must have participated in prior FIRST training. Each participant should bring the DEMO robot they have already built and a laptop with MindstormEV3 software downloaded and ready to go.

**ST02 - Circuits that Create Light, Sound & Motion (Grade: 3 to 5)**
Explore concepts of energy and electricity as you formulate strategies to engage students in constructing circuits that can make any classroom theme come alive. Learn to create a gadget that produces sound, motion or light when a box or card is opened or closed! Learn to connect lights, buzzers or motors to batteries, and then to control these circuits with homemade switches. Develop hidden switches, which turn something on or off when a box or card is opened or closed. Culminating projects include mystery boxes, carousels, electric puppets or illuminated dioramas. **SPECIAL REQUIREMENT:** None

**ST03 - Design Challenges from Our Classroom to Yours (Grade: K to 12)**
Explore several design challenges that can be modified for any grade level with a focus on topics such as circuits, biomimicry, buoyancy, and architecture. Participants will engage in several classroom strategies that can support collaboration and creativity in the classroom. Key components of STEM learning will be highlighted such as success through failure, testing to inform iterations and divergent solutions. Participants will walk away with classroom ready resources, materials, and a community of educators to immediately start implementing STEM in their own classrooms. **SPECIAL REQUIREMENT:** None

**ST04 - Digital Game Design as Project-Based Learning (Grade: 6 to 8)**
Work with Educators from The Museum of the Moving Image to learn how to incorporate digital game design into your classroom curriculum. The workshop will explore how game design can be connected to a range of curricular areas while supporting students’ development of vital 21st century skills, from basic programming to collaboration and design thinking. **SPECIAL REQUIREMENT:** Participants will be asked to travel to the Museum of the Moving Image for one day of this workshop.

**ST05 - Dive into Design Thinking (Grade: K to 12)**
Cooper Hewitt, Smithsonian Design Museum will offer an interactive 3-day workshop for K-12 educators, introducing design thinking as a vehicle for creative problem-solving across curricula. Educators will “play designer” and discover a variety of hands-on activities that connect to project-based learning, STEM disciplines, 21st Century Skills, and Common Core Standards. **SPECIAL REQUIREMENT:** Participants will be asked to travel to the Cooper Hewitt Smithsonian Design Museum for two days of this workshop.

**ST06 - Edible Laboratory (Grade: 6 to 12)**
Science and cooking are beautifully interconnected. Cooking not only hides a tremendous wealth of scientific concepts, but also embodies the scientific method as practiced by scientists; it is a highly experimental process, guided by trial and error. Therefore, cooking is a perfect model system for exploring the wonders of Biology, Physics, and Chemistry in great detail, from molecules and cells, to organisms and planets. **SPECIAL REQUIREMENT:** None

**ST07 - Engineering, PBL & STEAM In Practice (Grade: 4 to 8)**
This session using Mosa Mack Science, will focus on project-based activities, STEAM assessments as well as engineering and design activities to integrate into the science classroom. Demonstrations include a three-lesson progression moving from animated science mystery to hands-on lab, and culminating with an engineering challenge. Educators will explore steps to move towards student-driven instruction, an understanding of meaningful engineering activities, and new tools to use in their classroom. **SPECIAL REQUIREMENT:** None

**ST08 - Introduction to the Engineering is Elementary Curriculum (Grade: 3 to 5)**
Build your knowledge of engineering and your confidence in teaching it through this learner-driven workshop designed for 3-5 educators. You’ll get hands-on experience with Engineering is Elementary© (EiE) materials and insights into the most effective strategies for teaching engineering at the elementary level. You will explore the EiE materials as well as a wealth of online educator resources to enhance your STEM instruction. **SPECIAL REQUIREMENT:** This session is open to educators who have not previously attended EiE training.
ST09 - Exploring Pedagogical Strategies in Engineering is Elementary (Grade: K to 5)
This Engineering is Elementary® (EiE) workshop Session is designed for K-5 educators who have attended a Level I EiE session, or who have taught the EiE curriculum. By reflecting on successes and challenges of implementing the EiE curriculum, participants will explore the teaching strategies and pedagogy behind the curriculum. Participants will have the opportunity to delve deeper into best practices for implementing a quality, integrative engineering curriculum so as to expand their knowledge and improve their practice.
SPECIAL REQUIREMENT: This is a level 2 session that is only open to educators who have attended an EiE session at a previous institute or who have taught the EiE curriculum.

ST10 - Green Design Lab: Cool Lessons on a Warming Planet (Grade: 7 to 12)
How can we prepare our students to build a more energy-efficient and sustainable future? This session presents Solar One Green Design Lab, an innovative K-12 curriculum guide that promotes real-world learning and sustainability through 5 units—Energy, Water, Food, Materials and Air. Teachers will participate in hands-on STEM activities, develop lesson plans, and learn how to integrate environmental science across disciplines. Participants will receive access to over 200 GDL lesson plans, standards alignment and a classroom materials toolkit containing small solar circuit building supplies, energy auditing supplies, and more! SPECIAL REQUIREMENT: None

ST11 - Green STEM: A Model for Real-World Learning (Grade: K to 12)
Join the National Wildlife Federation’s NYC Eco-Schools for an exciting, hands-on program featuring educators who will demonstrate how to use GREEN STEM as a model for real-world learning — cleaning up oil spills, designing schoolyard gardens, using digital tools to investigate storm water runoff and climate change, detecting the impact of human activities on water quality, and designing and building hydroponic systems to investigate urban agriculture. Participants will leave with “food for thought” and curriculum resources for use in and out of the classroom! Green STEM blends traditional STEM with environment-based education and emphasizes project-based learning and real world problem-solving. SPECIAL REQUIREMENT: None

ST12 - Making the Standards for Mathematical Practice Come Alive (Grade: K to 5)
Leverage the neuroscience of learning through spatial temporal mathematics (ST Math). Experience problem-solving lessons and instructional strategies that engage all students and provide access to rigorous, standards-based problems through interactive, digital content. Learn how to use visual problems to promote student perseverance and communication through classroom discussions and blended learning techniques. SPECIAL REQUIREMENT: None

ST13 - Real-World STEM in the LEGO Education Classroom (Grade: 6 to 8)
Join us to experience how LEGO® Education Simple and Motorized Machines and MINDSTORMS® Robotics will challenge your middle school students to apply their STEM knowledge to creatively solve real world problems. This workshop will immerse participants in a project-based environment to experience how to bring STEM learning to life. SPECIAL REQUIREMENT: None

ST14 - STEM in the Garden (Grade: K to 12)
Interested in starting a school garden at your school, but aren’t sure how to begin? Looking for ways to make your garden a center for hands-on, inquiry-based learning? Join Grow to Learn staff for an exciting workshop focused on planning, building, and using a school garden. We’ll cover all the gardening basics plus engaging STEM activities to use with students. This workshop is open to K-12 schools that currently have or are planning a school garden of any type (indoor, outdoor, hydroponic, etc.). It is recommended that attendees bring a laptop to the workshop and come prepared with possible space(s) at their school for a garden and approximate dimensions of that garden space. Schools will leave this workshop registered with Grow to Learn (making them eligible to apply for Grow to Learn Mini-Grants and to receive free gardening materials), prepared to begin a school garden project, and armed with STEM activities to incorporate into classroom gardening! SPECIAL REQUIREMENT: None

ST15 - Teaching STEM through Art & Design (Grade: 3 to 5)
NYSCI has developed new approaches to integrating art and design into STEM disciplines to spark creativity and interdisciplinary learning. Participants will engage in hands-on design activities and learn how to use NYSCI’s latest iPad-based Noticing Tools that allow students to make meaningful mathematical and scientific discoveries in the context of compelling digital art and design projects. Facilitators will demonstrate how such projects can support CCS-M and NGSS practices, how to integrate storytelling with STEM, and how teachers can effectively draw out core science and mathematical concepts as students design and make expressive works. SPECIAL REQUIREMENT: Participants should bring an iPad to this session if they have access to one.
ST16 - Teaching STEM through Sustainability (Grade: 9 to 12)
Learn how to integrate themes of sustainability and the urban environment into a STEM education program for students at the 9 - 12 grade levels. Participants will learn key concepts in sustainability and their application to four specific areas affecting the urban environment - water, waste, energy, and buildings. Each topic will be presented within a multidisciplinary context with examples of hands-on and classroom activities designed to reinforce student learning. College and career opportunities in the field of sustainability and strategies for engaging partners to connect students to these opportunities will be a key focus of the workshop. SPECIAL REQUIREMENT: None

COMPUTER SCIENCE (CS) TRACK SESSIONS – These offerings begin at Spring Institute and continue at Summer Institute

CS01 - Bootstrap:1 Programming & Algebra (Teach AY 16-17) (Grade: 8 to 10)
Bootstrap is a curricular module that teaches students to program their own video games using purely algebraic concepts. The class is compact and flexible, requiring roughly 20-25 hours of instructional time. Each lesson is aligned to National and NY State standards for mathematics, allowing teachers to use existing classroom time to integrate Bootstrap. In this workshop, we will explore the research and pedagogy behind the curriculum, investigate the cognitive challenges for students struggling with algebra, and practice the entire curriculum together from start to finish. SPECIAL REQUIREMENT: This program is intended for teachers of Algebra 1.

CS02 - Bootstrap:1 Programming & Algebra (Teach Spring 16) (Grade: 8)
Bootstrap is a curricular module that teaches students to program their own video games using purely algebraic concepts. The class is compact and flexible, requiring roughly 20-25 hours of instructional time. Each lesson is aligned to National and NY State standards for mathematics, allowing teachers to use existing classroom time to integrate Bootstrap. In this workshop, we will explore the research and pedagogy behind the curriculum, investigate the cognitive challenges for students struggling with algebra, and practice the entire curriculum together from start to finish. SPECIAL REQUIREMENT: This program is aimed to support 8th math grade teachers, whose students will have recently completed the NY State 8th grade mathematics exam. This program is ONLY for teachers who intend to implement Bootstrap with their classes in May or June of 2016.

CS03 - Codesters: Coding for Middle School Math & Tech (Grade: 6 to 8)
Codesters is designed to help teachers bring coding into their classrooms and integrate coding into core academic subjects. Teachers will be introduced to core coding concepts and techniques for teaching those concepts to students and will learn how to use the online coding platform to successfully teach coding to a classroom of students with engaging, project-based coding lessons. Participants will explore a fully built out coding curriculum and unique math-integrated lessons for teaching statistics and probability through coding-powered activities. Upon completion teachers will be prepared to teach Python level 1 and Statistics & Probability with Coding. SPECIAL REQUIREMENT: None

CS04 - Coding to Learn with Creative Computing (Grade: K to 5)
This session is led by ExpandED Schools and prepares elementary teachers to embed computer science activities into existing courses to boost creativity, empowerment, and young people’s development as computational thinkers – individuals who can draw on computational concepts, practices, and perspectives across disciplines and contexts. Participants will learn how to introduce fundamental computational concepts and design practices through non-computer activities. Then, participants will learn to use Scratch, a free computer programming language and online community to help students code to learn more about music & sound, sports, storytelling, games, art and social media, while building common core concepts. This session concludes with multiple assessment approaches. SPECIAL REQUIREMENT: None

CS05 - Creative Web Development & Programming (Grade: 8 to 12)
Code/Interactive is offering Creative Web Development & Programming, which introduces educators to HTML, CSS, and JavaScript using a robust curriculum that includes elements of design, entrepreneurship, and critical thinking skill development. Educators learn how to build web site projects using HTML and CSS with guidance from easy online learning tools. Next teachers are introduced to programming concepts with Scratch, a block-based programming language, and finally they learn JavaScript with a series of projects and lessons. While they learn fundamental professional skills, educators complete entrepreneurship activities, including designing their own technology solutions to real-world problems using design thinking challenges. Participating teachers
are provided with a full student-facing curriculum and all materials necessary to successfully deliver the course to students. SPECIAL REQUIREMENT: None

**CS06 - Education in Computer Science & Entrepreneurship (Grade: 9 to 12)**
Iridescent’s Technovation program is the world’s largest technology entrepreneurship program for girls. Technovation’s mission is to build a young woman’s sense of self-efficacy, so that she can solve hard problems & start new things - using technology. Girls from all around the world learn to program a mobile app to solve a problem in their own community and to launch their startups through this 12 week program. We will provide professional development to teachers in Android-App Inventor mobile app-programming and entrepreneurship. While the global competition is for girls only, the curriculum is appropriate for mixed-gender classrooms. SPECIAL REQUIREMENT: None

**CS07 - Engage in STEM & Computer Science Learning with Game Design (Grade: 6 to 8)**
Learn how to engage students to think, solve hard problems, and fluently use tech-tools, coding and online resources in an engaging, social, participatory learning environment. Using Globaloria, a blended-learning platform, teachers will explore computer science, game design and coding as a tool in their classroom. Teachers will learn how to integrate STEM learning into their classroom and differentiate for a variety of learners. Teachers will walk away with the tools needed to implement an engaging unit of game design and coding into any course. SPECIAL REQUIREMENT: None

**CS08 - Get the Most Out of Choice Time with Robotics (Grade: 3 to 5)**
Learn how to bring STEAM into your classroom by incorporating engineering and robotics into choice time using Legos alongside the team from Sunset Spark. This workshop will help teachers learn how to successfully introduce fundamental concepts in mechanics and robotics into their general ed, ICT, ELL, and self-contained classrooms. Our workshop will help ELL’s and native speakers work together to build language skills and concepts around spatial reasoning and engineering. We will cover how to combine mini-lessons, read alouds, and choice time with hands-on building to develop language skills and instill confidence and excitement around engineering and robotics in both teachers and students. SPECIAL REQUIREMENT: None

**CS09 - Programming Fundamentals for STEM Educators (Grade: 9 to 12)**
Leading technology training provider General Assembly will offer a three-day workshop on teaching programming fundamentals and exposing high school students to careers in technology. The workshop will enable teachers to introduce students to programming fundamentals, expose them to careers in tech, and empower them with the basics of the JavaScript, HTML, and CSS programming languages. The course is specifically designed to empower high school teachers to introduce students to these subjects. No previous experience with programming is required. SPECIAL REQUIREMENT: None

**CS10 - Project Code: Computer Science x Biology (Grade: 9 to 12)**
Project Code, a division of Urban Arts Partnership, implements an arts-based approach to computer science education by using videogame and animation design to stimulate student engagement in STEM learning. In this session, participants will acquire classroom-tested methods for teaching high school biology by integrating games and animations created with Scratch. Students first modify pre-developed games that model difficult-to-visualize aspects of biological systems (e.g. diffusion, osmosis, and cell organelles). After growing proficient with Scratch, students work to create original games about the various systems of the human body, thereby achieving increased competency in both biology and computer science. SPECIAL REQUIREMENT: Must be Living Environment or biology-related electives teacher

**CS11 - Teaching Biorobotics in the Classroom (Grade: 5 to 9)**
Iridescent has developed a unique, scaffolded biorobotics curriculum through which students learn to build mechanical robots inspired by nature using non-commercial kits and everyday materials. Unlike many Robotics programs, this program is not competitive and appeals to younger children by making nature/animals the primary focus. Students learn observation skills, basic circuitry, how to build mechanisms from everyday materials, how to use electrical engineering tools, as well as the value of curiosity, creativity and persistence. From this foundation, students are introduced to programming (Processing) and using Arduinos to automate their mechanical robot and program its sensors. Through this training, teachers will be introduced to key elements of the biorobotics curriculum and how to implement it in the classroom. SPECIAL REQUIREMENT: None

**CS12 - Integrating Coding into Any Discipline (Grade: 5 to 8)**
Bring coding into your classroom through a medium tweens + teens love. Using a web-based tool called Vidcode, students use JavaScript (a common web development language) to customize their own videos, photos and graphics. Built by female engineers on
a mission to increase girls’ participation in computer science, this flexible full-year curriculum appeals to all students by tapping into a hobby they are already immersed in: video and photo sharing. Projects include virtual reality, computer vision, hardware and visual effects. Participants will take away methods and resources for integrating computer programming into their teaching. You’ll walk away from these sessions with lesson plans customized for your class and feel empowered to help your students learn computer science. SPECIAL REQUIREMENT: None

CS13 - Visualize Ecosystems with Data & Hands-on Projects (Grade: 9 to 12)
This session will be led by the Beam Center and provides first-hand experience in running computer simulations of climate change and ecosystem dynamics. Data visualizations about the competition for shared resources, natural selection, climate change or the spread of disease within ecosystems can be created and adapted on the fly using simple computational models and NetLogo programming. In addition, you will create a physical computing project-- a 3-D tactile ecosystem using LilyPad and conductive thread-- to more fully demonstrate the concepts to students. The workshop will feature design thinking, programming, fabrication and science content with an engaging hands-on activity centered on sustainability and environmental science. SPECIAL REQUIREMENT: None

CS14 - Processing: Coding & Visual Arts (Grade: 8 to 12)
Hello world! In this workshop, participants become comfortable with basic principles of Computer Science by learning Processing, a language designed “for learning how to code within the context of the visual arts.” After participating in this course, you will have tools and experience to integrate Processing into your visual art curriculum as an exciting new medium. This session is led by NYC educators and the NYCDOE Software Engineering Program.
SPECIAL REQUIREMENT: Intended for Arts Teachers

CS15 - Robots, Microcontrollers & Computing for STEM Education (Grade: 9 to 12)
Hands-on exercises in Robotics will help students visualize and practice science and math concepts that they otherwise find difficult or abstract. Since many STEM principles are inherently incorporated into performing simple tasks with robots, these exercises can illustrate connections between STEM disciplines and real-world applications. Through exploration, guided training and hands-on projects followed by discussion, participants will be exposed to robot design principles and core concepts of robotics and associated programming languages led by staff from the NYU Tandon School of Engineering. Practical ways to implement robotics in science and math classrooms will be demonstrated. SPECIAL REQUIREMENT: None

CS16 - The Science & Math of Driverless Cars (Grade: 6 to 8)
How does a driverless car “think?” Join experts from Ergopedia to explore how science, mathematics, engineering, and excitement come together in driverless cars - which everyone agrees are just around the corner. Ten extraordinary lessons in this hands-on session integrate math skills (measurement, graphing), science skills (speed, velocity, Newton's laws) and engineering (designing a solution, testing, revising). Our clever robot can both measure and drive itself, building student understanding of motion graphs and concepts. We program our solutions with a unique system that has students successfully writing code that moves the robot less than ten minutes after the lesson starts. SPECIAL REQUIREMENT: None

LEADERSHIP (APL) TRACK SESSION WITH APPLE EDUCATION – This offering is only available to school principals

APL01 - Thought Leadership through Technology: STEM Institute for Principals (Grade: Principals Only)
As technology is changing the way we teach and learn, powerful creative tools, interactive textbooks, and a universe of apps and content make for endless learning possibilities. For you, as a leader in your institution, it’s important that you develop a vision for how technology will expand what’s possible for learning. The STEM Institute will offer an opportunity for you to refine the transformation you envision for your school, identify goals of your initiative, and explore models for managing change. Analysis of current classroom practices will help you develop a roadmap to advance your initiative as you explore a wide variety of digital content, learning resources and opportunities available. Learn, share and explore with fellow school leaders to develop a plan of action to enhance the opportunities you support and provide in your school that encompass technology. SPECIAL REQUIREMENT: Open only to School Principals.