STEM-II Professional Development Course:
Electricity, Electronics, & Arduino™

2 days / 16 hours
Course Designed by: Bill Young, NBCT, STEM PROS™

Course Description

Take your STEM teaching to the next level beyond our STEM-I course with this advanced 2-day course focused on electricity, electronics, **Arduino™** programming, and soldering skills. This course is designed to deepen your understanding of the inner workings of robotics and electronics, empowering you to teach these concepts with confidence. Whether you're new to electronics or looking to refine your skills, this hands-on course will equip you with the knowledge and tools to bring cutting-edge STEM concepts into your classroom.

Here's what you'll gain:

- **6 hours of hands-on electronics labs,** including soldering, circuit design, and Arduino™ programming.

- **6 hours of interactive skill-building,** focusing on understanding circuits, resistors, transistors, and other key electronic components.

- **4 hours of collaborative project development,** where you'll design and build your own electronic projects.

Participants will leave with the skills to teach basic and even advanced electronics and robotics concepts, join a collaborative network of teachers to share lesson ideas and feedback, as well as gain **exclusive access to the course Google Classroom** to extend their learning.

Target Audience

K-12 teachers, instructional coaches, and administrators who have completed the 3-day STEM-I professional development course. This course is designed for educators who want to develop or expand their knowledge of electronics, **Arduino™**, and soldering to enhance their STEM programs.

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Course Goals

This 2-day STEM-II course is designed to:

- Develop teachers' expertise in electricity, electronics, and circuit design.
- Introduce teachers to **Arduino™** programming and its applications in the classroom.
- Teach soldering skills for building and repairing electronic circuits.
- Empower teachers to integrate electronics and robotics concepts into their STEM curriculum.
- Provide cost-effective strategies for building and maintaining electronics labs in schools.
- Foster collaboration among educators to share innovative ideas and practices.

Learning Outcomes

By the end of this course, participants will be able to:

- Design and build basic electronic circuits using components such as DC motors, LEDs, resistors, transistors, and photoresistors.
- Use **Tinkercad™** to design and simulate electronic and Arduino™ circuits.
- Program and troubleshoot **Arduino™** boards for various projects.
- Solder electronic components to create functional circuits.
- Integrate Arduino™ projects into STEM lessons, including robotics and automation.
- Use the **Grove Sensor Kit™** to explore advanced sensor applications.
- Develop hands-on activities for teaching electricity, electronics, and robotics.
- Collaborate with peers to design and present an Arduino™ –based project.

Required Course Materials

- Notebook
- Pencils/Pens
- Laptop computer (with **Tinkercad™** access)
- Gmail account
- Tennis shoes

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Grading

To receive full credit, all participants must:

- Attend all sessions and actively participate in hands-on activities.
- Collaborate with peers to design and present an **Arduino™**-based project.
- Complete all assigned tasks and demonstrate proficiency in soldering and Arduino™ programming.

Documentation, including sign-in sheets and certificates of completion, will be provided to schools and certifying organizations upon successful completion of the course.

Classroom Use of Course Materials

Participants are authorized to access and use all lesson plans, circuit designs, **Arduino™** code, and Google Classroom resources provided during the course. These materials may be used in their own classrooms and schools. Some materials are subject to copyright laws and may **not** be reproduced for monetary gain or posted on public websites.

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Class Schedule*

Day One	Start	End	
Morning	8:30 AM	9:00 AM	Welcome and Introductions
Session	9:00 AM	9:30 AM	Introduction to Electronic Components & Electrical Theory
	09:30 AM	10:30 AM	**Tinkercad™ Electronic Circuit Simulator:** Basics of Circuit Design
	10:30 AM	11:30 AM	**Soldering 101:** Introduction to Soldering Techniques & Safety
	11:30 AM	12:30 PM	**EDC Project #1:** Build a Night Light Circuit
	12:30 PM	1:00 PM	Lunch
Afternoon	1:00 PM	2:00 PM	**EDC Project #2:** Laser Target Circuit
Session	2:00 PM	3:30 PM	**Printed Circuit Board Projects:** Strobe Lights & Jitterbug
	3:30 PM	4:30 PM	**STEM PROS Custom Board Design:** Collaborative Project Planning
	4:30 PM	5:00 PM	Clean-Up & Questions
Day Two	**Start**	**End**	
Morning	8:30 AM	9:00 AM	Welcome Back & Recap of Day 1
Session	9:00 AM	10:00 AM	**Tinkercad™ Arduino™ Circuit Simulator:** Basics of Arduino™
	10:00 AM	11:00 AM	**Arduino™ 101:** Software Setup & Basic Programming
	11:00 AM	12:00 PM	**Arduino™ Project #1:** Night Rider Circuit
	12:00 PM	12:30 PM	Lunch
Afternoon	12:30 PM	1:30 PM	**Arduino™ Project #2:** Making Music with Arduino™
Session	1:30 PM	3:00 PM	**Arduino™ Project #3:** Grove Sensor™ Kit Exploration
	3:00 PM	4:30 PM	**Collaborative Project Development:** Design & Present
	4:30 PM	5:00 PM	Clean-Up & Questions

*We reserve the right to modify the schedule to add additional activities not scheduled, as time permits, to meet the needs and requests of participating teachers.

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Equipment Needed

- Participants Bring: Laptop for **Tinkercad™**
- Provided:
  - Soldering iron and kit
  - Circuit parts for cardboard circuits (LEDs, resistors, transistors, photoresistors, batteries, hot glue guns, foamboard)
  - Printed circuit board projects
  - **Arduino™** boards
  - **Grove Sensor Kit™** (comes with **Arduino™**)
  - Cost of provided materials: $75 per person (included in tuition)

Content Knowledge

Content knowledge instruction includes, but is **not limited** to:

- **Electricity**: Circuits, conductors vs. insulators, current, amperage, voltage, motors
- **Electronics**: Resistors, transistors, LEDs
- **Arduino™ Programming**: Basics of coding, sensors, actuators
- **Soldering**: Techniques, safety, applications
- **Sensors**: Using the **Grove Sensor Kit™** to explore light, sound, motion, & environmental sensors