Marquette Engineering Outreach is excited to offer another season of programs for students interested in learning about ENGINEERING! The Office of Engineering Enrollment Management and Outreach seeks to enhance the mission of Marquette University and the College of Engineering by developing and preparing future Marquette engineers to be critical thinkers, problem solvers and leaders that will contribute to a global society.

To register for a Marquette Engineering Outreach Program, please visit: http://www.marquette.edu/engineering/academies_register.shtml

Engineering Academy registrations are accepted on a first-come, first-served basis. Waiting lists are started once a class reaches capacity. Instructions for submitting payment are provided on the registration site. For more details about our programs, including current course availability, visit www.marquette.edu/engineering/academies.shtml

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**WeDo LEGO Robotics**

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Time</th>
<th>Grades</th>
<th>Capacity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session 1</td>
<td>Saturday, January 24</td>
<td>9am-Noon</td>
<td>2,3,4</td>
<td>16</td>
<td>$40</td>
</tr>
<tr>
<td>Session 2</td>
<td>Saturday, January 24</td>
<td>1-4 pm</td>
<td>2,3,4</td>
<td>16</td>
<td>$40</td>
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</tbody>
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Students can build animals, soccer players and more, and then add movement with fun, simple, drag-and-drop software created in LabVIEW. The LEGO Education WeDo platform redefines robotics for younger ages, making it possible for primary school students to build and program their own robots. In WeDo LEGO Robotics, students will build LEGO models featuring working motors and sensors; program their models; all while having fun developing their skills in science, technology, engineering, and mathematics. WeDo LEGO Robotics provides a fantastic hands-on learning experience that actively engages children’s creative thinking, teamwork, and problem-solving skills.

**Soldering 101**

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<thead>
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<th>Date</th>
<th>Time</th>
<th>Grades</th>
<th>Capacity</th>
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<tbody>
<tr>
<td>Saturday, January 24</td>
<td>9 am – 12 pm</td>
<td>8,9,10</td>
<td>16</td>
<td>$55</td>
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Soldering is a must-have skill for all sorts of electrical and electronic work. Soldering involves melting a material called solder with a heated hand tool called a soldering iron; the melted solder cools and forms a bond between two items. With the skills learned in this class, students will be able to set up their own electronic workshops and start building electronic kits on their own. Soldering 101 will introduce students to basic electronic components such as resistors, capacitors, LEDs, switches, and the ubiquitous 555 timer integrated circuit (IC). Students will be given a kit with a soldering iron and all components to be soldered on a proto board and packaged to produce a system with a variable speed blinking light. Diagnostic instruments, including a DMM and oscilloscope, will be used to test and analyze the finished product. Students will be able to take their kits home to continue developing their soldering skills. Basic soldering is a skill that is easy to learn and not too hard to master - it just takes practice!

**An Introduction to 3D Printing**

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<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Grades</th>
<th>Capacity</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Saturday, January 31</td>
<td>9 am – 3 pm</td>
<td>7,8,9,10</td>
<td>12</td>
<td>$85</td>
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3D printing is an exciting new capability that is now possible through many relatively low cost products. In this class, students will learn how basic 3D printers work and will see a PrintrBot 3D printer in operation. Through class exercises, students will also learn how 3D CAD software, such as Autodesk Inventor, can be used to create the 3D printer output. Students will even have the opportunity to design and print their own creation.
### Introduction to LEGO MINDSTORMS EV3 Robotics

**Saturday, February 7**

9am-Noon  

Class Capacity: 16  

$40

Students will be introduced to the latest generation of LEGO MINDSTORMS by designing, building, and programming LEGO MINDSTORMS EV3 robots. Students will work in pairs to “teach” their robots to perform specific tasks using a combination of external sensors and internal programming instructions. In this workshop format, students new to the EV3 will receive introductory lessons and guidance while those more experienced with the EV3 can work on advanced and independent projects of their choice. Prior experience with robotics is NOT required – all learners are welcome! To see more about the LEGO MINDSTORMS EV3, visit [http://mindstorms.lego.com](http://mindstorms.lego.com).

### Exploring Electricity

**Saturday, February 7**

9am-Noon  

Class Capacity: 16  

$40

In this class, students will learn some basic electrical engineering theory about static electricity, current, and magnetic fields. The class will include several electrifying demonstrations and hands-on activities and will also give students an opportunity to build their own elementary direct current (DC) motors. Motors are theirs to keep, take home, and use to share their new knowledge with family members!

### iHeels for 5th - 7th grade

**Saturday, February 14**

9am – Noon  

Class Capacity: 16  

$40

Almost everything in our world has been touched in one way or another by an engineer. This iHeels (Inspiring Hands-on Engineering Experiences with Ladies of STEM) workshop will give young ladies a chance to experience the fun, challenge and excitement of engineering. They will explore what engineers do and the many career paths a female engineer can take — paths you probably never even considered! Girls will work together to learn how engineers work to solve today’s problems through hands-on activities focused on the Engineering Design Process and may involve structures, electrical circuits, environmental impacts, computers, even the chemistry of making lotion! Female engineering instructors lead the group, and students will leave with more confidence in problem solving, design and analysis of solutions, and know that an engineering career can lead to amazing opportunities for women!

### STEMMING with Hanna: Simple Machines

**Saturday, February 14**

9am – Noon  

Class Capacity: 14  

$40

In this class, students will develop an understanding of how familiar objects work through investigation and hands-on activities. Students will learn what makes simple machines work, how they make everyday tasks easier, and how engineers use these simple machines when making bigger machines. By playing with and manipulating models, they experience pulleys, levers, gears, and wheels and axles while exploring energy, buoyancy, and balance. Students will be given tools and tasks to promote scientific inquiry.

### Introduction to Animations with ALICE

**Saturday, February 21**

9am – 12pm  

Class Capacity: 16  

$40

‘Alice’ is an innovative 3D computer programming environment that makes it easy to create an animation for telling a story, an interactive game, or video to share. ALICE is designed to give students exposure to object-oriented programming. By manipulating objects in their virtual world, students gain experience with all programming constructs typically taught in an introductory computer engineering programming course. Students learn fundamental programming using 3D objects (e.g., people, animals, and vehicles) to populate a virtual world and create a program to animate the objects. ALICE allows students to drag and drop graphic tiles to create a program and see how their animation runs, easily understanding the relationship between programming statements and behavior of objects in their animation. No prior programming experience is required to participate in this course. Learn more about ALICE online at [www.alice.org](http://www.alice.org).

### Video Game Programming with ALICE

**Saturday, March 7**

9am – 3pm  

Class Capacity: 14  

$85

Video games result from creating characters and action using software. The ‘Alice’ program provides all the ingredients for the implementation and testing of video game ideas. This class will introduce some of the basics of video games and describe the features of Alice that can be used for game implementation. Students will then use the illustrated techniques to modify games examples with their own ideas.
**STEMMING with Hanna: Fluids**

**Grades 3, 4, 5**

**Saturday, March 7**

**9am – Noon**

**Class Capacity: 14**

$40

In this class, students will learn about fluids and fluid dynamics in a fun, inquiry-based setting. Through a series of demonstrations and hands-on activities, students will gain a solid understanding of what a fluid is, how they behave, and how their unique properties can be lots of fun to explore! Get ready to “go with THE FLOW” and dive into the weird and wacky world of fluids!

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**iHeels for 8th - 10th grade**

**Grades 8-10 (girls only)**

**Saturday, March 21**

**9am – Noon**

**Class Capacity: 16**

$40

Almost everything in our world has been touched in one way or another by an engineer. This iHeels (Inspiring Hands-on Engineering Experiences with Ladies of STEM) workshop will give young ladies a chance to experience the fun, challenge and excitement of engineering. They will explore what engineers do and the many career paths a female engineer can take — paths you probably never even considered! Girls will work together to learn how engineers work to solve today’s problems through hands-on activities focused on the Engineering Design Process and may involve structures, electrical circuits, environmental impacts, computers, even the chemistry of making lotion! Female engineering instructors lead the group, and students will leave with more confidence in problem solving, design and analysis of solutions, and know that an engineering career can lead to amazing opportunities for women!

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**Sensing and Control with EV3**

**Grades 5, 6, 7, 8**

**Saturday, March 28**

**9am – 3pm**

**Class Capacity: 14**

$85

The Lego Mindstorms EV3 is a very capable small computing system which can be used for many fun applications from robots to science fair data monitors. This class will explore the use of the basic EV3 sensors as well as a variety of other low cost and interesting sensors (i.e. camera, magnetic, acceleration ..). The other focus of the class will be on the use of the EV3 to control motion and action using sensors as input.

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**Web Design 1: How to Teach Yourself HTML & CSS**

**Grades 8-adult**

$55, or $75 for a family

**Saturday, March 28**

**9 am – 1 pm**

**Class Capacity: 14**

$55

Just about everyone browses the internet on a daily basis. Wouldn’t it be great to go beyond browsing web pages and learn to create them? HTML is the primary language of web design, and CSS (Cascading Style Sheets) define how web pages look. Learning to use these tools seems like a daunting task, but with the wealth of online resources available, you can easily teach yourself how to make your own web pages. This class will explain the basics of HTML and CSS, give you a chance to design a sample web page, and show you all the information you need to continue developing web pages all on your own! **This class is part 1 in a 3-part series. You do not have to sign up for parts 2 & 3 if you decide to take this class.**

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**Web Design 2: How to Teach Yourself PHP & MySQL**

**Grades 8-adult**

$70, or $90 for a family

**Saturday, April 11**

**9 am – 2 pm**

**Class Capacity: 14**

$70

The internet isn’t just a one-way street used to present information. Web pages can also be designed to communicate information back-and-forth between your own PC and another computer on the internet. Things like online forms, email contact pages, and telephone directories all utilize this kind of communication. In this class you’ll learn the basics of how to use PHP, a scripting language that allows computers to talk to each other over a network, and MySQL, a database program that stores information online. You’ll also learn how to utilize a wealth of online resources to continue exploring PHP and MySQL on your own! **This class is part 2 in a 3-part series. It is required that you enroll in part 1 of this series before taking this class. However, you do not have to sign up for part 3 if you decide to take this class.**
Web Design 3: How to Teach Yourself Javascript  
Grades 8-adult $70, or $90 for a family  
Saturday, April 18  
9 am – 2 pm  
Class Capacity: 14  
Ever wonder how a web page can automatically tally the costs of items in an online shopping cart or instantly fill information on web page when you make a selection? The secret to many of these “magical” web tasks is Javascript, a scripting language that uses your web browser to process information it receives online. In this class, you’ll learn the basics of Javascript, use it to create some sample web pages, and learn how to use online resources to continue exploring Javascript on your own. This class is part 3 in a 3-part series. It is required that you enroll in part 1 and 2 of this series before taking this class.

Helicopters & Drones  
Grades 7,8,9,10,11 $85  
Saturday, April 18  
9 am – 3 pm  
Class Capacity: 14  
Technology advances have enabled the creation of hobby helicopter and quad-rotor products, which can be flown and enjoyed by individuals for all levels of skill. In this class, students will learn the basics of why helicopters and quad-rotors fly and how they are controlled. The course will illustrate the technology of “drones” by using quad-rotors with onboard cameras. Students will have hands-on experience flying a number of different types of helicopters and drones.

STEMMING with Hanna: Energy, Pollution & Environment  
Grades 3,4,5 $40  
Saturday, April 25  
9 am – noon  
Class Capacity: 14  
How do we clean the water from the oceans and lakes so that it's safe enough for us to drink? In this session of STEMming Science, students will learn about "green" movements through demonstrations with solar panels, pollution clean-up, green houses, and many other activities. They will also discover how these concepts affect the planet and ways environmental engineers use these concepts to provide a better living environment for society.

S.T.E.M. = Science, Technology, Engineering & Math!

Marquette Engineering Outreach  
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