**SUMMER 2015**

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](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](http://www.marquette.edu/engineering/academies.shtml)*

<table>
<thead>
<tr>
<th>Program</th>
<th>Entering Grades</th>
<th>Fee</th>
<th>Dates</th>
<th>Time</th>
<th>Class Capacity</th>
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<tbody>
<tr>
<td><strong>Bridges and Cities: Exploring Civil Engineering</strong></td>
<td>Grades 5-8</td>
<td>$100</td>
<td>Wednesday, June 17 – Thursday, June 18</td>
<td>8:30-Noon</td>
<td>16</td>
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<tr>
<td><strong>Introduction to Animations with ALICE</strong></td>
<td>Grades 6-9</td>
<td>$50</td>
<td>Session 1 - Wednesday, June 17</td>
<td>1-4:30 pm</td>
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<tr>
<td>OR</td>
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<td>Session 2 - Thursday, June 18</td>
<td>1-4:30 pm</td>
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<tr>
<td><strong>Introduction to LEGO MINDSTORMS EV3 Robotics</strong></td>
<td>Grades 5-8</td>
<td>$200</td>
<td>Session 1 - Monday, June 22 – Thursday, June 25</td>
<td>8:30 – Noon</td>
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<tr>
<td>OR</td>
<td></td>
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<td>Session 2 – Monday, July 6 – Thursday, July 9</td>
<td>8:30 – Noon</td>
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Bridges, highways, and buildings – we use them every day. But how much do we really understand them? This class will help students learn about civil engineering through fun, hands-on activities. Students will build their own bridges, run computer simulations, create towers and learn about the highways and other infrastructure that make cities run smoothly! We’ll also have a chance to investigate our very own Engineering Hall, which is a living laboratory filled with many interesting features that we can explore.

‘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).

LEGO MINDSTORMS EV3 has arrived!! Students will be introduced to the latest generation of LEGO MINDSTORMS by designing, building, and programming LEGO MINDSTORMS EV3 robots. In this new class students will learn to create and command Robots that walk, talk, think, and do just about anything imaginable using the EV3 graphical software language. Students will work in pairs to “teach” their robots to perform specific tasks using a combination of external sensors and internal programming instructions. 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).
Catching the Wind: Engineering Windmills & Parachutes
Entering Grades 2–4 $150
Monday, June 22 – Wednesday, June 24
8:30-Noon
Class Capacity: 16

Students will become mechanical and aerospace engineers as they use their knowledge of wind and weather to design and create moving machines that can be used to capture wind, a renewable energy source. A variety of materials will be tested to make the best sails, and windmills will be engineered with blades strong enough to lift a load off the ground! On another day, students will explore and analyze data related to three variables of a parachute: suspension line length, canopy size, and canopy material in order to eventually complete their design challenge: creating a parachute that is “Mission Ready.” This class introduces students to mechanical and aerospace engineering using Engineering is Elementary curriculum. Additional activities include soda straw rockets and Alka-Seltzer pop rockets to learn more about air and flight.

iPalm: Integrated Project to Accelerate Learning in Math
Session 1 - Monday, June 22 – Thursday, June 25
Entering Grades 8-10 $200
8:30-Noon
Class Capacity: 20

Session 2 - Monday, June 22 – Thursday, June 25
1-4:30pm
Class Capacity: 20

iPalm is intended to strengthen the math skills of students interested in pursuing science, technology, engineering and math (STEM) careers. Participants learn to combine math skills with engineering applications to see how math concepts relate to the real world. Students will learn to read and use a variety of precise measuring tools, incorporate Excel to make calculations based on measurements, create 3D models with engineering design software, and more by applying math to various engineering formulas. Each day will include a mathematics component, engineering component and career exploration component. Class will be led by Mr. Ken Kessenich, Project Lead The Way Master Teacher (PLTW www.pltw.org). Faculty from the Marquette University College of Engineering will be involved with the engineering components. Two sessions are being offered, please select either morning or afternoon.

Family Engineering
Session 1 - Monday, July 6 & Tuesday, July 7
Session 2 - Monday, June 22 – Thursday, June 25
Entering K-2nd Grade $70/family
1-4:30pm
Class Capacity: 20

Family Engineering is an engineering education program that actively engages elementary-aged children and families in fun, hands-on, engineering activities and challenges. Children attend Family Engineering with any adult over 18 - parent, grandparent, aunt, uncle, neighbor, or other important adult in their lives. Research shows a significant improvement in children’s self-confidence and learning skills when families are actively engaged in their learning. By showing interest and exploring engineering with their children, parents and other caregivers can positively influence a child’s attitude about engineering, as well as encourage children to consider a possible career in engineering. Increasing awareness, appreciation and understanding of engineering will open eyes to the significant impact of engineering in our daily lives, and to the tremendous career opportunities available around the globe.

Exploring Electricity
Session 1 - Monday, July 13 – Tuesday, July 14
Session 2 - Wednesday, July 15 – Thursday, July 16
Entering Grades 5–8 $100
8:30-Noon
Class Capacity: 16

In this class, students will learn some basic electrical engineering theory about static electricity, current, and magnetic fields. Students will explore common electric devices such as motors, magnets, hair dryers, and even computer chips! Students will build their own electrical circuits and create their own batteries. The class will include several electrifying demonstrations and hands-on activities. Students will leave with a greater understanding of things they use every day!

Helicopters & Drones
Entering Grades 8–10 $200
Monday, July 13 – Thursday, July 16
8:30-Noon
Class Capacity: 16

This class is for students who want to understand how helicopters and multi-rotor drones fly and are controlled. The class will provide some background on the evolution of flying machines. Starting with fixed winged radio controlled (rc) aircraft students will 'learn to fly' using a flight simulator and radio controlled airplanes. Helicopters and how they fly will be described and training will be done again with flight simulation and hands on flying of rc helicopters. Finally quad-rotor aircraft will be described and flown. Through the class all students will have multiple opportunities to test and improve their flying skills with multiple types of rc aircraft.
**WeDo LEGO Robotics**

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<tr>
<td>1 OR 2</td>
<td>Monday, July 13 &amp; Tuesday, July 14</td>
<td>8:30am-Noon OR 1-4:30 pm</td>
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<td>3 OR 4</td>
<td>Wednesday, July 15 &amp; Thursday, July 16</td>
<td>8:30am-Noon OR 1-4:30pm</td>
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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.

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**Video Game Programming with ALICE**

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<td>OR 1-4:30 pm</td>
<td>Class Capacity: 14</td>
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*Prior Experience with ALICE required!* 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.

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**Earth-friendly: The world of Environmental Engineering**

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<td>OR 8:30-Noon</td>
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In this class, students will examine the environment and learn how to preserve it, clean it, and make it a better place for all creatures. Students will engage in plenty of hands-on activities, including water analysis, investigating environmental cleanup, and discovering how plants can be used to positively affect our cities. We'll even take a peek at the green roof right here in Engineering Hall. This class will help students discover how environmental engineers use this information to provide a better living environment for society!

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**Using Tablets for Fun and Education**

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<th>Entering Grades 8-12</th>
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Smart phones, iPads, tablets and notebooks are becoming and everyday part of the experience and tools for students from elementary through high school. Almost everyone who has used smart devices has used, loaded and talked about ‘apps’. Some apps are games, some provide information, some are utilities and on and on. In this class the students will learn how ‘apps’ are created and using a set of computer programs, will create an app. The app development will use the Android operating system and the Nexus 7 tablet. Each student will work on a computer and will have a tablet to work with. While the students likely will not create the next Angry Birds, they will learn some of the skills needed to understand how it might be done.

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**Design, Construction and Operation of BIG ROBOTS**

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This class is for students interested learning how to create big competition robots of the size used in FIRST Robotics Competitions. The class will start with discussion of going from a competition requirement to design ideas. These ideas will then be developed through 3D CAD and then extended to the mechanical, electrical and software systems needed to create a complete robot. During the class the students will work as teams to assemble, test and operate complete robots.
Web Design 1: How to Teach Yourself HTML & CSS
Entering Grades 8-adult
Monday, July 27
8:30 am – Noon
Class Capacity: 14
$50

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.

Web Design 2: How to Teach Yourself PHP & MySQL
Entering Grades 8-adult
Tuesday, July 28
8:30 am – Noon
Class Capacity: 14
$50

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! It is required that you have completed part 1 and 2 of this series before taking this class
(either in spring or summer.) 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
Entering Grades 8-adult
Wednesday, July 29
8:30 am – Noon
Class Capacity: 14
$50

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 have completed part 1 and 2 of this series before taking this class
(either in spring or summer.)

Web Design Workshop – Facilitated Creation Time!
Entering Grades 8-adult
Thursday, July 30
8:30 am – Noon
Class Capacity: 20
$50

This session is open to students who have previously taken ANY Marquette Web Design class.
Having learned the basics of web design, students will take the day to explore their own web creations. An
instructor will be on hand to guide exploration of concepts not already covered in class, help students locate
resources, and suggest strategies for problem solving. Students who attend this session will be well on their way
to having their own website, ready to go live after they leave class!
This class is for students who want to learn about their world through some common and some very uncommon sensors. Among sensors used in the class will be a thermal imaging camera, a big ear (parabolic sound reflector), a magnetic sensor to look for things underground, a Geiger counter, tools of spies (bug detectors), an infrared and ultraviolet imaging camera and numbers of others. The basic principles of the sensors will be described and students will have the opportunity use them.

3D CAD with AutoDesk Inventor
Entering Grades 5-7
Monday, July 27 – Thursday, July 30
1-4:30pm
Class Capacity: 20

Three dimensional computer-aided design (3D CAD) is an essential skill for engineers and designers working with product design and development in many applications, including automotive, shipbuilding, and aerospace industries, industrial and architectural design, prosthetics, and many more. 3D CAD is also widely used to produce computer animation for special effects in movies, advertising and technical manuals. In this class, students will learn how to create their own 3D CAD models that convey not only design shapes but also information about materials, processes, dimensions, and tolerances. This class will introduce students with no 3D CAD experience to this exciting technology and add to the skills of students who have had some prior training in their school programs. AutoDesk is just one of many CAD software packages used by high schools (including the Project Lead The Way high school pre-engineering curriculum), colleges and universities, and businesses around the world.

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