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

Mathematics At Work  Entering Grades 8-10  $200
Section 1 - Monday, June 13 – Thursday, June 16  8:30-Noon  Class Capacity: 20
OR
Section 2 - Monday, June 13 – Thursday, June 16  1-4:30pm  Class Capacity: 20
Mathematics at Work 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 sections are being offered, please select either morning or afternoon.

Helicopters & Drones  Entering Grades 8-10  $200
Monday, June 13 – Thursday, June 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.

Battle Bots: Design & Repair  Entering Grades 7-10  $200
Monday, June 13 – Thursday, June 16  1-4:30pm  Class Capacity: 15
Sparks fly, motors scream, and losers weep! Battle Bots are an exciting and challenging part of robotics competition. In this class the students will learn the types of Battle Bot competitions, how the Bots are designed, built and, yes, sent into battle. Using a number of pre-constructed Battle Bots, students will carry out some final assembly, testing and operation with the objective and determining which survive. Note: no fire will be used and the weapons will be made out of wood rather than hardened steel – we want our Battle Bots (and our students) to survive for future classes!
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<tr>
<th>Course</th>
<th>Grades</th>
<th>Duration</th>
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<tr>
<td><strong>We-Girls!</strong></td>
<td>Entering Grades 6-8</td>
<td>Monday, June 13 – Thursday, June 16</td>
<td>$50</td>
<td>Class Capacity: 12</td>
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<td><strong>Entering Virtual Worlds</strong></td>
<td>Entering Grades 7-10</td>
<td>Monday, June 20 – Thursday, June 23</td>
<td>$200</td>
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<td><strong>Design, Construction and Operation of BIG ROBOTS</strong></td>
<td>Entering Grades 8-12</td>
<td>Monday, June 20 – Thursday, June 23</td>
<td>$200</td>
<td>Class Capacity: 15</td>
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<td><strong>Family Engineering</strong></td>
<td>Entering K-2nd Grade</td>
<td>Monday, June 20 &amp; Tuesday, June 21</td>
<td>$70/family</td>
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<td><strong>Introduction to LEGO MINDSTORMS EV3 Robotics</strong></td>
<td>Entering Grades 5-8</td>
<td>Monday, June 27 – Thursday, June 30</td>
<td>$200</td>
<td>Class Capacity: 16</td>
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<td><strong>Introduction to LEGO MINDSTORMS EV3 Robotics</strong></td>
<td>Entering Grades 5-8</td>
<td>Monday, July 11 – Thursday, July 14</td>
<td>$200</td>
<td>Class Capacity: 16</td>
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Electrical and Computer Engineering Department Presents: We Girls: Explore the fascinating world of microcontrollers! In this course, girls will tour Marquette’s state-of-the-art electrical engineering facilities, learn what a microcontroller is, be introduced to development boards and learn about programming in C. There will be plenty of hands-on experiences and lots of time spent with electrical engineering professionals. We Girls is funded by National Science Foundation (NSF) and supported by the Engineering Outreach Summer Academies.

‘Virtual Worlds’ create a three dimensional experience of sight and sound. You become a part of the created world. Virtual Worlds can be constructed using computer graphics, multi-camera photography or a combination of these. Hardware can be as simple as a cell phone and $15 cardboard interface to large, full-scale labs which can surround you with the world. This class will teach approaches to creating Virtual Worlds using computers, cameras and the resources of the Marquette Engineering Visualization Laboratory. Students will have the opportunity to experience Virtual Worlds using a variety of hands on exercises.

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.

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.

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). Two sections are being offered, please select either June or July.
Introduction to Animations with ALICE
Entering Grades 6-9
$45
Section 1 - Monday, June 27
1-4:30 pm
Class Capacity: 20
OR
Section 2 - Tuesday, June 28
1-4:30 pm
Class Capacity: 20

‘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.

Video Game Programming with ALICE
Entering Grades 7-10
$200
Monday, July 11 – Thursday, July 14
8:30 – Noon
Class Capacity: 14

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.

3D CAD with AutoDesk Inventor
Entering Grades 5-9
$200
Monday, July 11 – Thursday, July 14
1-4:30pm
Class Capacity: 18

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.

STEMming with Nicholas: World of Biomedical Engineering
Entering Grades 3-5
$200
Monday, July 18 – Thursday, July 21
8:30-Noon
Class Capacity: 16

This course will introduce students to the amazing world of biomedical engineering through a series of discovery activities and hands-on experiences. Students will explore the human skeletal system and design a “replacement joint” that will be tested for durability. They will learn about the electrical nature of the human nervous system and see how electrical circuits operate. Lastly students will be develop a simple application on a tablet.

WeDo LEGO Robotics
Entering Grades 2-4
$100
Section 1 – Monday, July 18 – Tuesday, July 19
8:30 – Noon
Class Capacity: 16
OR
Section 2 – Wednesday, July 20 – Thursday, July 21
8:30 – Noon
Class Capacity: 16

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. Two sections are being offered, please select either Monday/Tuesday or Wednesday/Thursday.
Advanced WeDo Robotics

Entering Grades 2-4  $100
Section 1 - Monday, July 18– Tuesday, July 19 1-4:30pm  Class Capacity: 16
OR
Section 2 – Wednesday, July 20 – Thursday, July 21 1-4:30pm  Class Capacity: 16

Engineers use their knowledge and experience to creatively solve problems and improve current designs. In this course, students will use their prior experience with the LEGO WeDo platform to design, build, and program robots from their own imaginations. The students will be challenged to complete one or more fun and interesting tasks, such as creating an accurate catapult, building a crane to lift objects, or designing a moving vehicle. Students will be introduced to basic machine design concepts and will learn some advanced WeDo programming functions. Two sections are being offered, please select either Monday/Tuesday or Wednesday/Thursday.

Engineering Cities and Environments

Entering Grades 4-6  $200
Monday, July 18 – Thursday, July 21 8:30-Noon  Class Capacity: 16

Engineers shape the world around us in some BIG ways! In this class, we will explore the fields of Civil and Environmental Engineering. Students will build bridges, run computer simulations, create towers and learn about the highways and other infrastructure that make cities run smoothly. We will also 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 also have a chance to investigate our very own Engineering Hall, which is a living laboratory that contains a huge array of technology for civil and environmental engineers!

Adventures in Coding

Entering Grades 5-8  $200
Monday, July 25 – Thursday, July 28 8:30-Noon  Class Capacity: 18

Software engineers design the instructions which run machines EVERYWHERE! In this class, students will use a variety of online and free resources to plan, test, and execute software programs using desktop PCs. Students will explore effective software design, learn about Object Oriented Programming (OOP), and become junior software engineers – all while having lots of fun!

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