Science, Technology, Engineering & Mathematics

Program of Study

BEN BARBER
INNOVATION ACADEMY

SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

Endorsement: Science, Technology, Engineering & Math

Robotics I
1856CT
(9-12)

Computer Science I (PLTW)
1050CT
Prerequisite: Algebra I
(9-12) ***LOTE Credit***

Principles of Applied Engineering
1610A/B
(9-12)

Gateway to Technology (PLTW)
(8th grade only)
This course can count toward an endorsement in STEM

OSHA Certification *Possible*

AC/DC Electronics
1841CT
Prerequisite: Geometry or concurrent
(10-12)

Computer Science II (PLTW)
1051CT
Prerequisite: Computer Science I
(9-12) ***LOTE Credit***

Introduction to Engineering Design (PLTW)
1835CT
Prerequisite: Geometry AND Robotics I OR Computer Science I
(9-12) ***Weighted Credit***

Solid State Electronics
1843CT
Prerequisite: AC/DC Electronics
(10-12)
*Can count as **advanced course** if 2 prior credits in STEM*

Unmanned Aircraft Systems Certification *Possible*

Edu-Drone I
1860CT
Prerequisite: Algebra I AND Must be 16 years old with DL before the end of the semester
(11-12)

Principles of Engineering (PLTW)
1836CT
Prerequisite: Geometry AND Chemistry OR IPC AND Intro to E Design
(10-12)
Science Credit/Weighted Credit

Aerospace Engineering (PLTW)
1834CT
Prerequisite: Principles of Engineering
(10-12) ***Weighted Credit***

Computer Integrated Manufacturing (PLTW)
1838CT
Prerequisite: Intro to Engineering AND Principles of Engineering
(10-12) ***Weighted Credit***

Engineering Design & Development
1845CT
Prerequisite: Computer Integrated Manufacturing OR Aerospace Engineering
(11-12) ***Weighted Credit***

Certification Requirement
The district will pay 100% of the cost of the certification test if students can show mastery by:
Passing a certification practice test
Maintaining an 80+ overall course average at the time of the certification test
If students don't meet the requirements above, they must pay 100% of the cost of the certification test

★ Certificate of Excellence can be earned for this course.

LEGEND						
Fill Color	Length	Credit	Fill Color	Length	Credit	To earn an endorsement, an MISD student must complete a coherent sequence for 4 or more credits that consist of 2 courses in the same program of study including at least 1 advanced CTE course
	18 weeks	1		HC - 18 weeks	0.5	
	36 weeks	2-3		HC - 36 weeks	1	
	College Course			Advanced Course		

Science, Technology, Engineering & Math

Recommended Career Pathways

General Engineering
- Robotics I
- Principles of Applied Engineering
- Introduction to Engineering Design
- Principles of Engineering (Engineering Science)
- Computer Integrated Manufacturing
- Engineering Design & Development

Met Endorsement Requirements

Industrial Engineering
- Robotics I
- Principles of Applied Engineering
- Intro to Engineering Design
- Principles of Engineering (Engineering Science)
- Computer Integrated Manufacturing
- Engineering Design & Development

Met Endorsement Requirements

Mechanical Engineering
- Robotics I
- Principles of Applied Engineering
- Intro to Engineering Design
- Principles of Engineering (Engineering Science)
- Computer Integrated Manufacturing
- Engineering Design & Development

Met Endorsement Requirements

Aerospace Engineering
- Robotics I
- Principles of Applied Engineering
- Intro to Engineering Design
- Principles of Engineering (Engineering Science)
- Aerospace Engineering
- Engineering Design & Development

Met Endorsement Requirements

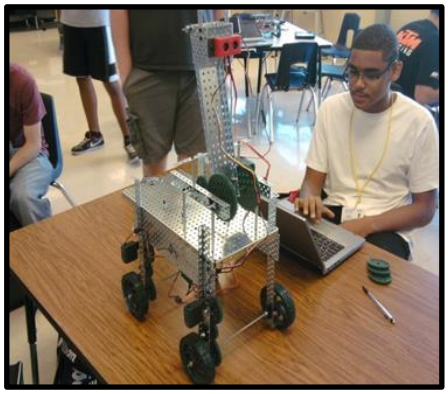
Electrical Engineering
- Robotics I
- AC/DC Electronics
- Solid State Electronics
- Engineering Design & Development

Met Endorsement Requirements

To earn an endorsement, an MISD student must complete a coherent sequence for 4 or more credits that consist of 2 courses in the same program of study including at least 1 advanced CTE course

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Robotics I



Prerequisite: None
Course: 1856CT Credits: 1 Length: 18 weeks Placement: 9-12

Course Description

Students will learn how to design, build, and program robots! They will participate in several projects and builds every week. Students will also the study the history and what impact robots have had on our society and its future. Visit Achieve Texas for more information on career opportunities at: http://www.achievetexas.org/Sciences.htm

Student Activities

We design robots!

We program robots!

We build robots!

Organizations/After School/Competitions

MISD BBCTA Competitions Robotics Team

FIRST FTC Robotics

Additional Considerations

Algebra I recommended. Students need fine motor skills and mobility.

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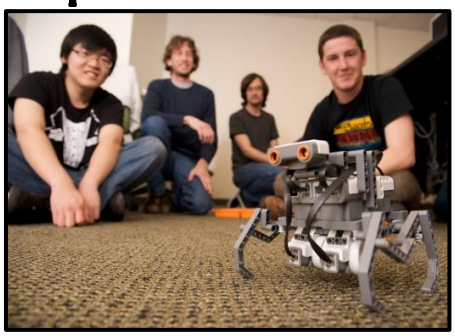
POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Computer Science I


Prerequisite: Algebra I

Course: 1050CT | Credits: 1 | Length: 18 weeks | Placement: 9-12

Course Description

Computer Science 1 will introduce students to the field of computer science and students will design solutions to solve real world problem. Programming environments or languages used in this course are App inventor, Python, and Vex Coding Studio.

Students can earn LOTE credit for this course.

Student Activities

Computer Science 1 course brings awareness and real world application of computer science across different technological domains. Students will explore careers in computer science, the impact of technology on our society, develop mobile applications, program robots to solve varying challenges and learn how to program using Python. Students will also learn design skills, teamwork, presentation preparation and delivery, real-world time management and many basic computer and media technology skills.

Organizations/After School/Competitions

Business Professionals of America

FTC Tech Challenge

Additional Considerations

Algebra I recommended. Students need fine motor skills and mobility. PLTW curriculum cannot be modified.

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POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Principles of Applied Engineering

(Home Campus Only)



Prerequisite: None

Course: 1610A/B **Credits: 1** **Length: 36 weeks** **Placement: 9-12**

Course Description

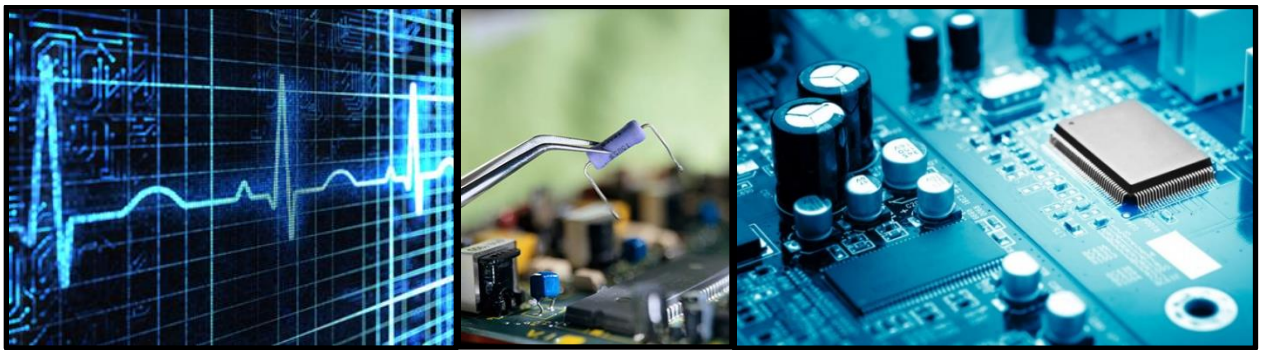
Principles of Applied Engineering provides an overview of the various fields of science, technology, engineering, and mathematics and their interrelationships. Students will develop engineering communication skills, which include computer graphics, modeling, and presentations, by using a variety of computer hardware and software applications to complete assignments and projects. Upon completing this course, students will understand the various fields of engineering and will be able to make informed career decisions. Further, students will have worked on a design team to develop a product or system. Students will use multiple software applications to prepare and present course assignments. *https://www.txcte.org/resource/science-technology-engineering-and-mathematics-college-and-career-planning-guide*

Student Activities

- Research Designs – 3D Cube Puzzle
- Drawings/Digital Rendering
- Modeling, Testing & Final Outcomes
- Mechanical – Trebuchet
- Materials – Wooden Roller Coaster
- Electrical – Circuits
- Computer – Robotic Arm
- Aerospace – Glider, Rocket, Model Plane
- Chemical Engineering
- Bioengineering – Prosthetics Device
- Environmental – Green Energy
- Product Analysis & Development

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

AC/DC Electronics



Prerequisite: Geometry or concurrent

Course: 1841CT Credits: 1 Length: 18 weeks Placement: 10-12

Course Description

Welcome to the world of electronics! The course is designed to provide all students the opportunity to learn about the basics electricity and electronics, available careers and job opportunities. This course is designed to provide broad introductory skills and knowledge of career opportunities and training requirement in electrical and electronics-related fields. This course teaches safety, technical math, job skills and introduces DC and AC electronic principles as well as digital concepts. Circuit construction, soldering, use of basic test equipment, residential wiring, tools and materials of the electrical and electronics industry, troubleshooting and project building are explored.

Student Activities

- Students use the concepts taught in class to research, design, build, troubleshoot and explain projects.
- Students participate in community service projects such as providing a video game room at a Christmas party for underprivileged children
- Students have the opportunity to compete in SkillsUSA

Organizations/After School/Competitions

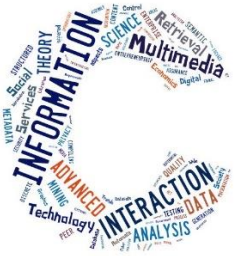
SkillsUSA is a partnership of students, teachers and industry working together to ensure America has a skilled workforce.

Additional Considerations

Students must have successfully completed Geometry without modification. Students need fine motor skills and mobility.

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Computer Science II



Prerequisite: Computer Science I

Course: 1051CT | Credits: 1 | Length: 18 weeks | Placement: 9-12

Course Description

In Computer Science 2 students will utilize the curriculum to learn more advanced topics in computer science. Students used the concepts they learn to create products and attempt to solve real-world problems using Python. Topics include algorithms, procedures and functions, iteration, recursion, arrays, object-oriented programming and graphical user interface. The concepts and skills student learn in this class will assist them in some STEM fields. Programming language used in this course is Python.

Students can earn LOTE credit for this course.

Student Activities

Computer Science 2 course offers real world application of computer science across different technological and engineering domains. Students will design, write and debug computer programs. Possible applications of concepts include simulations, robotics programming, app design, and games.

Organizations/After School/Competitions

Business Professionals of America

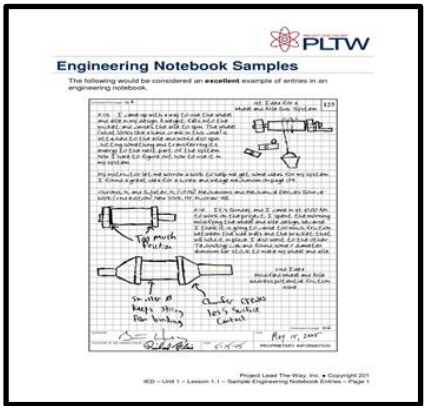
FTC Tech Challenge

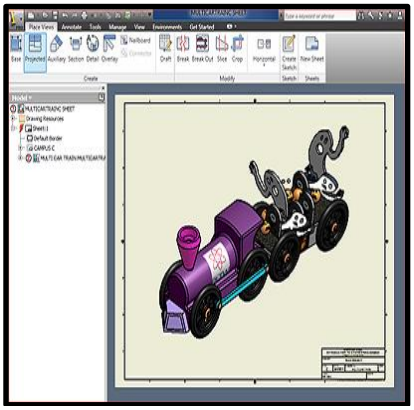
Additional Considerations

Algebra I recommended. Students need fine motor skills and mobility. PLTW curriculum cannot be modified.

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Introduction to Engineering Design





Prerequisite: Geometry AND Robotics OR Computer Science I

Course: 1835CT **Credits: 1** **Length: 18 weeks** **Placement: 9-12**

Course Description

The major focus of the course is learning how to take an idea through a design process that will eventually be a manufactured or produced. Students will learn about various aspects of engineering and engineering design, such as how engineers communicate through drawing. Students will apply what they learn through various activities, projects, and problems. Students have the opportunity to receive college-level recognition such as college credit, scholarships, and admissions preference.

Students can earn weighted credit for this course.

Student Activities

* CAD Solid Modeling
* Reverse Engineering
* Consumer Product Design Innovation
* Marketing
* Graphic Design
* Engineering Ethics
* Modeling
* Sketching
* Measuring, Statics and Applied Geometry
* Presentation Design and Deliver
* Engineering Drawing Standards

Additional Considerations

Students must have successfully completed Algebra I without modification. Cannot modify curriculum.

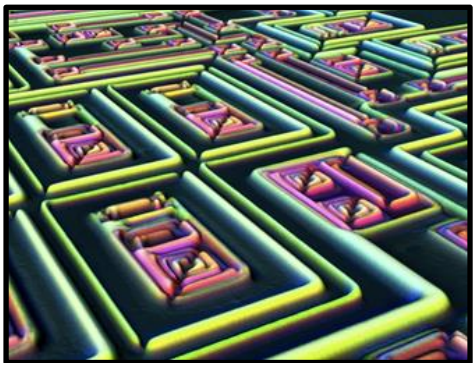
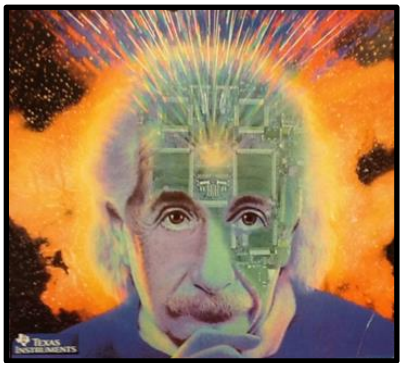
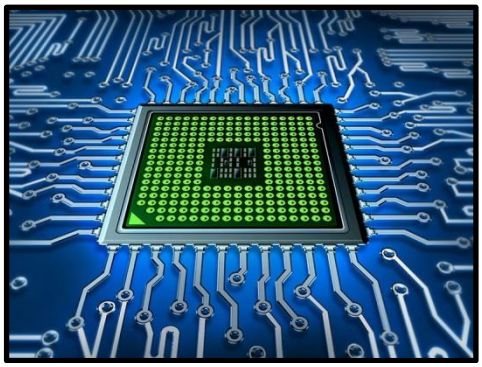
Organizations/After School/Competitions

Robotics Club

Shine Runners Solar Car Racing Team

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Solid State Electronics

Prerequisite: AC/DC Electronics

Course: 1843CT Credits: 1 Length: 18 weeks Placement: 10-12

Course Description

This class builds on the skills learned in AC/DC Electronics. Students will be required to develop a Project Development Plan and do research on the various projects they will build as a part of the course. Topics of study include circuit application, robotics, microprocessors, optic electronics, voice sensors, high voltage, power supplies, amplifiers, oscillators, active devices, solid state applications, video and sound circuits, integrated circuits, television and radio theory and application, digital electronics, fundamentals of logic and other areas of electronics found in the industry.

Student Activities

- Students use the concepts taught in class to research, design, build, troubleshoot and explain projects.
- Students participate in community service projects such as providing a video game room at a Christmas party for underprivileged children
- Students have the opportunity to compete in SkillsUSA

Organizations/After School/Competitions

SkillsUSA Champions at Work

Additional Considerations

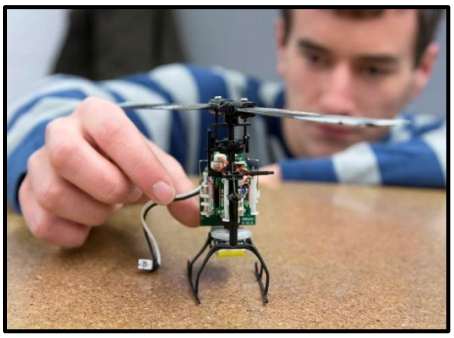
Students must have successfully completed Geometry without modification. Students need fine motor skills and mobility.

Certificate of Excellence

Students can earn a Certificate of Excellence by achieving a specific list of real world skills related to this course. For the list of skills, please visit goo.gl/9VM3a9

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Edu-Drone I



Prerequisite: Alg I AND must be 16 years old with DL before the end of semester

Course: 1860CT Credits: 1 Length: 18 weeks Placement: 11-12

Course Description

Learn

Students learn about large-and small-type UAS systems, the industries they are revolutionizing, sensor payloads, how to analyze collected data, and much more.

Practice

Students practice with simulated UAS flights at the end of each class. Students work on flight skills from the very beginning of the course.

Fly

Students participate in live flight training throughout the course, preparing them for FAA certification and enabling them to work in a high-demand STEM field

Organizations/After School/Competitions

Business Professionals of America

FTC Tech Challenge

Additional Considerations

Students need fine motor skills and mobility.

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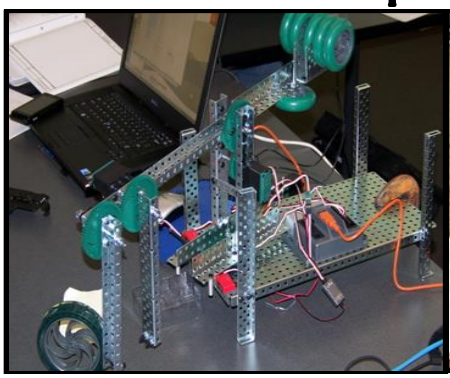
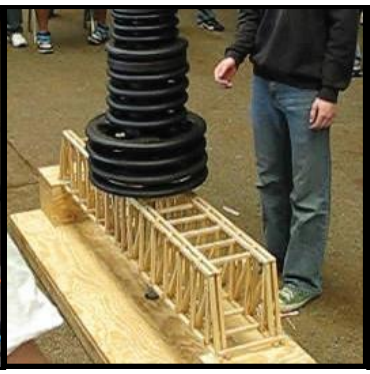
POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Principles of Engineering


Prerequisite: Geometry AND Chemistry OR IPC AND Intro to Engineering Design
Course: 1836CT Credits: 1 Length: 18 weeks Placement: 9-12

Course Description

This course explores the wide variety of careers in engineering and technology and covers various technology systems and manufacturing processes. Using activities, projects, and problems, students learn firsthand how engineers and technicians use math, science, and technology in an engineering problem-solving process to benefit people. **Course can be used as an additional science credit for graduation. Students can earn weighted credit for this course.**

Student Activities

Overview and Perspective of Engineering: Students learn about the types of engineers and their contribution to society.
Communication and Documentation: Students collect and categorize data, and produce graphics
Design Process: Students learn about problem solving and how products are developed, including how engineers work in teams. Students will be required to create graphical representations, keep an engineer's notebook, and make written and oral presentations.
Engineering Systems: Students learn about mechanical, thermodynamics, fluid, electrical, and control systems.
Statics: Students learn about measurement, scalars and vectors, equilibrium, structural analysis, and strength of materials.
Materials and Materials Testing: Students learn the categories and properties of materials, including how materials are shaped and joined, and materials testing.
Engineering for Quality and Reliability: Students will use precision measurement tools to gather and apply statistics for quality and process control. Students will also learn about reliability, redundancy, risk analysis, factors of safety, and liability and ethics.
Dynamics: Students will be introduced to dynamics/kinematics.

Organizations/After School/Competitions

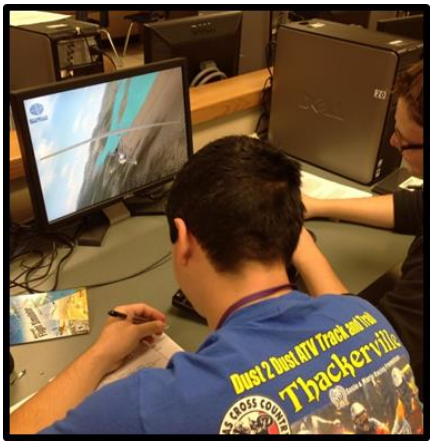
Shine Runners Solar Car Racing Team, FTC Robotics, Technology Student Association

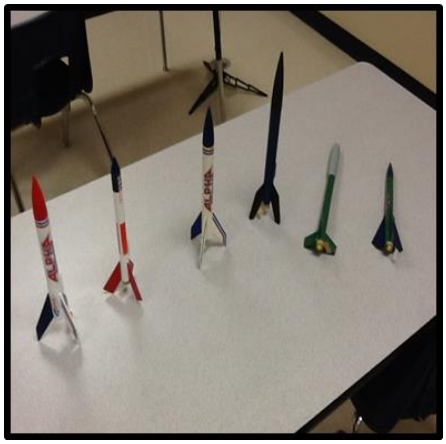
Additional Considerations

Students must have successfully completed Geometry without modification. Cannot modify curriculum.

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Aerospace Engineering



Prerequisite: Principles of Engineering

Course: 1834CT Credits: 1 Length: 18 weeks Placement: 10-12

Course Description

Aerospace Engineering is the branch of engineering that deals with aircraft, spacecraft, and their related systems. The course explores the evolution of flight, flight fundamentals, flight simulation, navigation and control, GPS, aerospace materials, propulsion, space travel, orbital mechanics, ergonomics, remotely operated systems and related careers. Students will analyze, design and build aerospace systems. While implementing these designs, students will continually work on their interpersonal skills, creativity and application of the design process. Students build gliders, build model rockets, use flight simulators, build composite materials, fly model planes, fly model helicopters, etc…

Students can earn weighted credit for this course.

Student Activities

- Build Gliders
- Build Model Rockets
- Fly Planes on Flight Simulators
- Build Composite Materials & Test
- Study Propulsion
- Study Flight Physiology

Additional Considerations

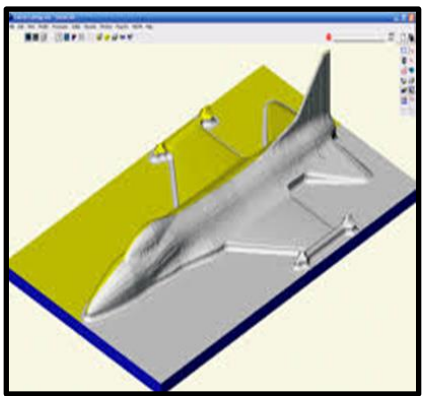
Students must have successfully completed Geometry without modification. Students need fine motor skills and mobility. Cannot modify curriculum.

Organizations/After School/Competitions

Shine Runners Solar Car Racing Team
FTC Robotics
Technology Student Association

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Computer Integrated Manufacturing



Prerequisite: Intro to Engineering Design AND Principles of Applied Engineering

Course: 1838CT Credits: 1 Length: 18 weeks Placement: 10-12

Course Description

In Computer Integrated Manufacturing the student will examine and utilize modern manufacturing practices and computer techniques used to design and build various projects from clients around the district. Students will learn about and incorporate their knowledge of robotics to laser cutting and engraving, and 3D printing to complete these projects.
Students can earn weighted credit for this course.

Student Activities

Student projects include:

1. Laser cutting and engraving key chains, signs, puzzles, toys, awards, and other items.
2. 3D Printing of miniatures, gears, toys, chess pieces, tools, etc.
3. Wood, plastics, and metal crafting
4. Robotics and Automation, CNC Milling and Lathe, and 3D modeling.

Additional Considerations

Students must have successfully completed Geometry without modification. Students need fine motor skills and mobility. Cannot modify curriculum.

Organizations/After School/Competitions

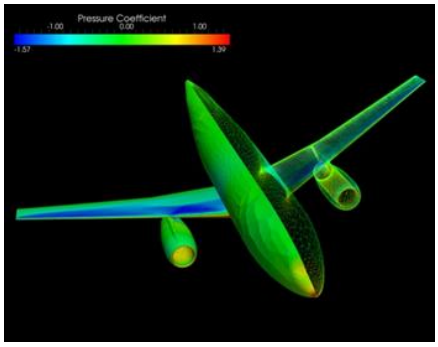
Shine Runners Solar Car Racing Team
FTC Robotics
Technology Student Association

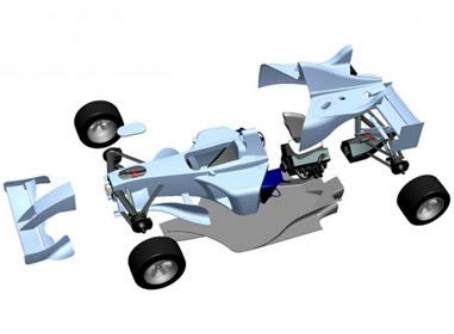
Certificate of Excellence

Students can earn a Certificate of Excellence by achieving a specific list of real world skills related to this course. For the list of skills, please visit goo.gl/9VM3a9

POS: Science, Technology, Engineering & Mathematics | Endorsement: STEM

Engineering Design & Development





Prerequisite: Computer Integrated Manufacturing OR Aerospace Engineering
Course: 1845CT Credits: 1 Length: 18 weeks Placement: 11-12

Course Description

This course is recommended for student pursuing a career in engineering. This course will provide students with the opportunity to master the design process to solve a design problem of their choosing. They will use prior knowledge to develop, model, and test their solutions. Each team will present and defend their solutions to a panel of experts.
Students can earn weighted credit for this course.

Student Activities

If you are interested in high-tech, fast-paced and lucrative work in the engineering industry, Engineering can not only provide you with a solid education while you are in high school, but also offer you the opportunity of an internship/job shadowing under an experienced engineer with a local engineering firm. This will provide you with the skills needed to build a great career in a variety of industries.

Organizations/After School/Competitions

Shine Runners Solar Car Racing Team
FTC Robotics
Technology Student Association