

S.T.E.M.-
Engineering Technology
CIP.: 15.0000
SCI.:21007A002

Engineering Technology is a diversified STEM program designed to give students real world problem solving skills through a medium of modern applied sciences.

Engineering Technology is structured to provide insight and exposure to the basics of each major technology discipline and the processes of research and development. Each student will: program, make three-dimensional models, explore computer numerical controls, learn kinematics, design robots, and breakdown the division of labor that encompasses an operational STEM team. Students are given projects to construct, and will master the process of taking an idea and making it a tangible object. Engineering Technology is in accordance with the curriculum of Illinois State University, and based on the combined efforts of the National Science Foundation and NASA. This course provides students the experience and foresight to generate knowledge for their future careers in the STEM fields.

Students will learn:

Take a 3D object, make an engineering drawing, model the object into software, 3D print and/or mill it on a CNC machine.

Reverse engineer to troubleshoot common technology.

Create an automated machine.

Make and manually control a robot.

Identify, research, imagine, plan, create, test, improve.

Work as a team to solve a problem, by specializing in a particular discipline.

Understand STEM terminology and vocabulary.

Become familiar with organic physics.

Utilize alternative energies in their homes.

Dictate a developmental community.

Understand circuitry.

Required Materials- Safety glasses, close toe shoes, pencil, notebook, folder, 32 gb flash drive.

Grading- A=100-90
 B=89-80
 C=79-70
 D=69-60
 F=59-0

Office Hours 6:00am - 7:00am, 3:10pm - 4:00pm

Engineering Syllabus 1:

<u>Unit</u>	<u>Coursework</u>
1	<u>Energy and Controls</u> (20 Days): Lesson 1.1 Mechanisms (2 Days) Lesson 1.2 Programming (6 Days) Lesson 1.3 Visual Logic (2 Days) Lesson 1.4 Reverse Engineering (4 Days) Lesson 1.5 Technical Drawings (2 Days) Lesson 1.6 Computational Design Problem – Program Execution (4 Days)
2	<u>Materials and Structures</u> (20 Days): Lesson 2.1 Statics & Dynamics (4 Day) Lesson 2.2 Material Properties (3 Days) Lesson 2.3 Soldering (2 Days) Lesson 2.4 3D printing (6 Days) Lesson 2.5 Civil Design Problem – Bridge Construction (5 Days)
3	<u>Flight Systems</u> (21 days): Lesson 3.1 Avionics (2 Days) Lesson 3.2 Principles (8 Days) Lesson 3.3 Flying Lessons (3 Days) Lesson 3.4 Electrical Design Problem – Build a Drone (8 Days)
4	<u>Robotics</u> (14 Days): Lesson 4.1 Drafting (2 Days) Lesson 4.2 Code to Pneumatics (2 Days) Lesson 4.3 Task Trials (5 Days) Lesson 4.4 Mechanical Design Problem- Build a robot (5 Days)

Year 1 Precursor- Earth Systems, Biology, Algebra 1 and Geometry.

Unit 1 Energy and Controls

- Mechanisms
 - Resistors, capacitors, motors, currents, electrical laws.
- Programming
 - Languages, introduction to script.
- Visual Logic
 - Programs and language variation.
- Reverse Engineering
 - Creating problems with, upgrade, and fixing regular household products.
- Technical Drawings
 - Solidworks sketches.
- Design problem
 - Draw a 3D idea on a 2D paper, and computer aided, with proper notation.

Unit 2 Materials and Structures

- Statics and Dynamics
 - Friction, physics, moving and stationary objects, forces.
- Materials
 - Weight to strength to cost ratio.
- Soldering
 - Practice, procedure, participation.
- 3D Printing
 - Function vs Fashion
- Design problem
 - Create the strongest bridge.

Unit 3 Flight Systems

- Avionics
 - Physics and utilization
- Construction
 - Theory and materials
- Flying Lessons
 - Introduction to controls.
- Design problem
 - Application course

Unit 4 Robotics

- Drafting
 - Design process
- Pneumatics
 - Range of motion, motor limits, controller limits, speed, precision vs. accuracy
- Task Trials
 - Provide a solution to a problem.

- Design problem
 - Build a robot

Engineering Syllabus 2:

<u>Unit</u>	<u>Coursework</u>
5	<p><u>Local Engineering Practicum</u> (25 Days):</p> <p>Lesson 5.1 Scout (4 Days)</p> <p>Lesson 5.2 Plan (3 Days)</p> <p>Lesson 5.3 Propose (1 Days)</p> <p>Lesson 5.4 Collect Data (4 Days)</p> <p>Lesson 5.5 Technical Drawing (10 Days)</p> <p>Lesson 5.6 Civil Design Problem II – Implementation/ Presentations (3 Days)</p>
6	<p><u>Models and Scale Practice</u> (20 Days):</p> <p>Lesson 6.1 Fluid Dynamics (2 Days)</p> <p>Lesson 6.2 R&D Methodology (3 Days)</p> <p>Lesson 6.3 Construction (5 Days)</p> <p>Lesson 6.4 3D Printing II (5 Days)</p> <p>Lesson 6.5 Engineering Design Problem – Aero/ Hydro Dynamics (5 Days)</p>
7	<p><u>Creation Problem</u> (21 days):</p> <p>Lesson 7.1 Topics & Groups (2 Days)</p> <p>Lesson 7.2 Draw (8 Days)</p> <p>Lesson 7.3 Create/ Print (3 Days)</p> <p>Lesson 7.4 Demonstration – Presentation (8 Days)</p>
8	<p><u>Autonomous Earth Movers</u> (9 Days):</p> <p>Lesson 8.1 ‘Sandbox’ (1 Day)</p> <p>Lesson 8.2 Vehicles (2 Days)</p> <p>Lesson 8.3 Programming (4 Days)</p> <p>Lesson 8.4 Revisions (1 Day)</p>

Year 2 Precursor: Overview of Year 1

Unit 5 Local Engineering Practicum

- Scout
 - Choose project and location.
- Plan
 - Create solution to a problem you see.
- Propose
 - Propose idea to legislative board for approval.
- Collect Data
 - Go to site for data collection.
- Technical Drawing
 - Construct solution
- Civil Design Problem II
 - Implement & collect data.

Unit 6 Models and Scale Practice

- Fluid Dynamics
 - Principles & Application
- R&D methodology
 - Steps in research and design.
- Construction
 - Drawing and 3D modeling
- 3D Printing II
 - Advance geometry and compound shapes
- Aero/ Hydro Dynamics
 - Build a wind/ water tunnel

Unit 7 Creation Problem

- Topics and groups
 - Segregate into disciplines.
- Draw
 - Design project.
- Create
 - Model project.
- Demonstrate
 - Have project perform.

Unit 8 Autonomous Earth Movers

- 'Sandbox'
 - What is open-world creation.
- Vehicles
 - Specialty vehicles.

- Programming
 - Make vehicles act autonomously.
- Revisions
 - Design better and cleaner code.

Dual Credit :

- CADD 101: CAD & Drafting (3 Credits)
- CADD 120: 3D Cad & Drafting (3 Credits)
- CADD 270: Solidworks- Parametrics 3D Solid Modeling (3 Credits)
- EET 101: Fundamentals of Electronics (2 Credits)
- EET 102: Electric Soldering, Circuit Network and Repair (2 Credits)
- EGR 100: Intro to Engineering Graphics (1 Credits)