

# Fundamentals of Engineering Overview

Content Area: **Engineering**  
Course(s): **FUND OF ENGIN**  
Time Period:  
Length: **90 Days**  
Status: **Published**

## Cover

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### **EAST BRUNSWICK PUBLIC SCHOOLS**

**East Brunswick New Jersey**

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Course Adoption: 1/7/1988

Curriculum Adoption: 1/7/1988

Date of Last Revision Adoption: 9/1/2017

## Course Overview

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## **COURSE DESCRIPTION**

This course is an introduction to the basics of the graphic design language. Communicating through drawings and sketches generated on the computer are essential to many careers in business and industry. The areas of study covered include the use of freehand, mechanical and computerized instruments in developing drawings.

One, two and three-view drawings are used to explain designs graphically as well as the language and terminology associated with each type of drawing. Through the use of TLA's (technology learning activities), the students will learn problem solving and design techniques. The problems will include the use of the design loop, computers and hands-on work. The students will be required to solve a problem and then produce the solution

## **COURSE SCOPE AND SEQUENCE**

Sequential Unit Description	Other Pacing Guide References	Proficiency (Summative) Assessments
Unit 1 - Autodesk Inventor Introduction/Basic CAD Functions		
<ul style="list-style-type: none"><li>• Course Introduction</li><li>• PC Login/PC Basics</li><li>• Autodesk Inventor Setup</li><li>• Line Types/Weights</li><li>• Basic Toolbar Functions</li><li>• Type, Font, Size, Placement</li></ul>	2 days	Formative: Teacher Observation of student Progress Teacher Conferencing  Summative: Drawing Plates
Unit 2 - Drawing a Titleblock in Autodesk Inventor		
<ul style="list-style-type: none"><li>• Autodesk Inventor Setup</li><li>• Titleblock</li><li>• Type, Font, Size, Placement</li><li>• Line Array</li><li>• Change Origin</li><li>• Read Measurements on Drawing</li></ul>	2 days	Formative: Teacher Observation of student Progress Teacher Conferencing  Summative: Titleblock
Unit 3- Horizontal/Vertical/Angled Lines		
<ul style="list-style-type: none"><li>• Drawing Tools</li><li>• Horizontal/Vertical Lines</li></ul>	2 weeks	Formative: Teacher Observation of student Progress Teacher Conferencing  Summative: Drawing Plates

- Lines on an Incline
- Erase/Trim Tools
- Centering
- Scaled drawings

#### Unit 4 - Circles/Curves

- Horizontal/Vertical Lines
- Drawing Tools
- Circles
- Arcs

2 weeks

Formative: Teacher Observation  
of student Progress  
Teacher Conferencing

Summative: Drawing Plates

#### Unit 5 - Orthographic Sketching

- Horizontal/Vertical Lines
- Identification/Orientation of Isometric Views.
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- Centering
- Line types and thicknesses
- Circles/Holes,
- Countersink/Counterbore

4 weeks

Formative: Teacher Observation  
of student Progress  
Teacher Conferencing

Summative: Orthographic  
drawing packet Hand Drawings  
Drawing Plates

#### Unit 6- Dimensioning Drawings

- Placement of dimensions
- Placement of dimensioning lines

3 weeks

Formative: Teacher Observation  
of student Progress  
Teacher Conferencing

Summative: Drawing Plates

#### Unit 7 - Technology Learning Activities

- Design Process/Design Challenge
- Design Process/Design Loop
- Problem Solving
- Safety
- Teamwork

6 weeks

Formative: Teacher Observation  
of Progress Planning  
Sketches in CAD Program  
Trial Run of TLA

Summative: Project Evaluation  
Questions. PowerPoint  
presentation

- 3D CAD Sketching
- Managing Resources

## **CONTENT FOCUS AREA AND COURSE NAME**

***Course Name: Engineering and Design Technology 1 - #1306***

Course Number	School Numbers	Course Level	Grade(s)	Credits	Min. Per Week	Elective/Required	Initial Course Adopted
1306	055	S	8-9	2.50	210	E	01/07/88

## **PRIMARY CONTENT AREA AND SECONDARY AREAS OF FOCUS**

NJCCC Standard	NJCCC Standard	NJCCCS Standard	
1. Visual and Performing Arts	5. Science	S 9. 21st Century Life and Careers	P
2. Health and Physical Education	6. Social Studies		
3. Language Arts Literacy	7. World Languages		
4. Mathematics	S 8. Technology	P	

## **Standards**

LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
TECH.8.2.8.A.1	Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e., telephone for communication - smart phone for mobility needs).
TECH.8.2.8.A.2	Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

TECH.8.2.8.A.3	Investigate a malfunction in any part of a system and identify its impacts.
TECH.8.2.8.A.4	Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
TECH.8.2.8.A.5	Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
TECH.8.2.8.B.1	Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.
TECH.8.2.8.B.2	Identify the desired and undesired consequences from the use of a product or system.
TECH.8.2.8.B.3	Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.
TECH.8.2.8.B.4	Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
TECH.8.2.8.B.5	Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.
TECH.8.2.8.B.6	Compare and contrast the different types of intellectual property including copyrights, patents and trademarks.
TECH.8.2.8.B.7	Analyze the historical impact of waste and demonstrate how a product is up cycled, reused or remanufactured into a new product.
TECH.8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
TECH.8.2.8.C.2	Explain the need for optimization in a design process.
TECH.8.2.8.C.3	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
TECH.8.2.8.C.4	Identify the steps in the design process that would be used to solve a designated problem.
TECH.8.2.8.C.6	Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
TECH.8.2.8.D.4	Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

## **Grading and Evaluation Guidelines**

### **GRADING PROCEDURES**

In terms of proficiency level the East Brunswick grades equate to:

A     Excellent- Advanced Proficient

- B Good- Above Average Proficient
- C Fair- Proficient
- D Poor- Minimally proficient
- F Failing- Partially Proficient

The final course proficiency grade will be based on students' performance throughout the course based on the identified New Jersey Core Content Standards for career and technical education and consumer, family and life skills (CPI's up to and including grade twelve). Students' individual grades will be based on performance in five units of instruction: Basic Drafting Techniques, 3D Drawings, Computer Aided Drafting, Structural Engineering, and Engineering Design.

### **COURSE EVALUATION**

Course achievement will be evaluated based on the percent of all pupils who achieve the minimum level of proficiency (final average grade) in the course. Student achievement levels above minimum proficiency will also be reported. Final grades, and where relevant mid-term and final exams, will be analyzed by staff for the total cohort and for sub-groups of students to determine course areas requiring greater support or modification.)

The goal of this course is for a minimum of 95% of the total number of enrolled students to attain at least the minimum proficiency level.

### **Other Details**

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#### **21005 Engineering - Comprehensive**

Engineering—Comprehensive courses introduce students to and expand their knowledge of major engineering concepts such as modeling, systems, design, optimization, technology-society interaction, and ethics. Particular topics often include applied engineering graphic systems, communicating technical information, engineering design principles, material science, research and development processes, and manufacturing techniques and systems. The courses may also cover the opportunities and challenges in various branches of engineering.