

STRANDS AND STANDARDS

PLASTICS 2



Course Description

This course is the second in a series of two courses focusing on the types of plastics, properties of plastics, and molding methods. A specific emphasis is given to the plastic injection molding as it relates to the manufacturing of components for consumer products.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	38.02.00.00.242
Concurrent Enrollment Core Code	None
Prerequisite	None
Skill Certification Test Number	None
Test Weight	N/A
License Area of Concentration	CTE or Secondary
Required Endorsement(s)	Plastics

STRAND 1

Students will follow safety practices.

Standard 1

Identify potential safety hazards and follow general laboratory safety practices.

- Assess workplace conditions regarding safety and health.
- Identify potential safety issues and align with relevant safety standards to ensure a safe workplace/jobsite.
- Locate and understand the use of shop safety equipment.
- Select appropriate personal protective equipment.

Standard 2

Use safe work practices.

- Use personal protective equipment according to manufacturer rules and regulations.
- Practice a culture of safety, maintain an attitude of safety in daily operations.
- Follow correct procedures when using any hand or power tools.
- Ref: <https://schools.utah.gov/file/4de1dd59-0425-4f76-9e33-fdcf5de45dbf>

Standard 3

Complete a basic safety test without errors (100%) before using any tools or shop equipment.

STRAND 2

Students will demonstrate knowledge of a basic plastic injection molding process and injection molding machine operations.

Standard 1

Describe the press operation.

Standard 2

Describe the role of automated manufacturing in the plastics industry.

Standard 3

Describe the need for material preparation.

Standard 4

Outline the melting/mixing process.

Standard 6

Describe the forming/packing process.

Standard 7

Describe the importance of cooling the product.

STRAND 3

Students will employ a basic design process to develop a solution to a design problem using plastic injection molding.

Standard 1

Identify the design problem and decide how to address it.

- Analyze market research to determine consumer wants and needs (requirements).
- Investigate existing design solutions.
- Identify requirements and constraints and determine how they will affect the design process and record them in an engineering notebook.
- Clearly and concisely define the problem to be solved and the measurements of successfully addressing the problem in an engineering notebook.

Standard 2

As a team, brainstorm possible solutions.

- Document multiple solutions in an engineering notebook.
- Evaluate the strengths and weaknesses of each proposed solution.
- Decide on and record the best solution in an engineering notebook.

Standard 3

Using available facilities and materials, create a prototype of the proposed design.

- Mathematical models
- 3D solid modeling
- 3D printed models
- Scale models

Standard 4

Test the prototype, record the results, and evaluate the performance of the design.

- Identify and record both failures and successes in an engineering notebook.
- Evaluate the performance of the prototype against the stated requirements.

Standard 5

Redesign the prototype by repeating the design process in order to further optimize the design.

- Reconsider any discarded ideas.
- Look for mathematical relationships and use them to identify the factors that affect the design the most.
- Record the results of the engineering process in an engineering notebook.

STRAND 4

Students will demonstrate the basic steps of product/process development and validation.

Standard 1

Establish a repeatable process.

Standard 2

Identify the common quality defects.

- Short shot
- Flash
- Sink marks, blush, flow lines & knit lines
- Material degradation (burning, discoloration, black specs)
- Dimension out-of-specification

Standard 3

Ensure that the product meets quality specifications.

Standard 4 (Optional)

Explore FDA requirements.

- Define the purpose and importance of regulatory bodies (FDA, ISO, Europe, etc.).
- Determine how a device is regulated, from submission for FDA clearance to recalls.
- Follow quality standards and procedures.

STRAND 5

Students will investigate future training opportunities and careers in engineering.

Standard 1

Investigate the USBE's CTE engineering pathway.

Standard 2

Identify what positions exist in the plastics molding industry.

For example:

- Machine Operators
- Toolmakers/Mold makers
- Engineers (Manufacturing, Design, etc.)
- Technicians (Process, Tooling, Mold Changeover, Quality Control, Maintenance, etc.)

Standard 3

Investigate different types of occupational training.

For example:

- Trade school
- Community College
- University
- Graduate Training

Standard 4

Recognize the importance of both "hard" and "soft" skills in the workplace.

Performance Skills

1. Employ a basic design process to develop a solution to a design problem using plastic injection molding.
2. Demonstrate practice of the *Technology & Engineering Professional Workplace Skills*.
<https://schools.utah.gov/cte/engineering/resources>
3. Participate in a significant activity that provides each student with an opportunity to render service to others, employ leadership skills, or demonstrate skills they have learned through this course, preferably through participation in a Career & Technical Student Organization (CTSO) such as SkillsUSA.