# SW138-SOLIDWORKS Plastics

## About This Course

Course Design Philosophy

The goal of this course is to teach you how to use SOLIDWORKS Plastics to optimize your part and mold designs for manufacturability so you can maximize part quality, avoid mold rework and decrease time to market. Specifically:

·Identify and avoid part and mold design features that cause injection molding manufacturing defects.

·Learn the most common SOLIDWORKS Plastics workflows to ensure your part and mold designs are easily manufacturable.

·Quickly and easily communicate your analysis results with other members of the design-to-manufacturing team.

The tools for working with plastic injection molding simulation in the SOLIDWORKS Plastics software are quite robust and feature rich. During this course, we will cover many of the commands and options in great detail. However, it is impractical to cover every minute detail and still have the course be a reasonable length. Therefore, the focus of this course is on the skills, tools, and concepts central to successfully working with SOLIDWORKS Plastics.

## Prerequisites

Students attending this course are expected to have the following:

- Mechanical design experience
- Fundamental knowledge of plastic materials, plastic part design and/or injection mold design
- Completed the course *SOLIDWORKS Essentials*
- Experience with the Windows™ operating system

## Course Length

The recommended minimum length of this course is 3 days.

This course is designed around a process- or task-based approach to training. Rather than focus on individual features and functions, a process-based training course emphasizes the processes and procedures you follow to complete a particular task. By utilizing case studies to illustrate these processes, you learn the necessary commands, options and menus in the context of completing plastics simulation and design optimization tasks.

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**Lesson 1:**
**Basic Flow Analysis**

- Basic Flow Analysis
- Stages in the Process
  - Units
- Element Types
- Shell Elements
- Solid Elements
- Manual or Automatic
- Meshing
- The PlasticsManager Tree
- Material
- Polymer
- Using the Databases
- Machines
- Injection Location
- Running a Flow Analysis
- Flow
- Pack
- Warp
- Cool
- Flow Results
  - Fill Time
  - Weld Lines
  - Results Adviser
- Exercise I: Basic Flow Analysis

**Lesson 2:**
**Detecting a Short Shot**

- Detecting Short Shots
- Stages in the Process
- Fill Settings
  - Definition Fill Setting Parameters
  - Filling Time and Injection Pressure Considerations
  - Report Text File
- Flow Front Central Temperature
  - Pressure at End of Fill
- Design Changes
  - Plastics to Modeling
  - Modeling to Plastics
  - Thickness Change
- Simulations After Design Changes
- Exercise 2: Short Shots

**Lesson 3:**
**Automation Tools**

- Automation Tools
- Stages in the Process
- Duplicate Study
- Copying Settings
  - Plastics File Management
- Batch Manager
  - Batch Controls
- Summary and Report
- Exercise 3: Design Changes

**Lesson 4:**
**Injection Locations and Sink Marks**

- Injection Locations and Sink Marks
- Stages in the Process
- Injection Location Rules
  - Positioning the Injection Location
  - Single vs. Multiple Injection Locations
  - Modeling for Injection Locations
  - Automatic Injection Location Selection
  - Predict Flow Pattern
- Sink Marks
  - Measure
  - Minimizing Sink Marks in Ribs
  - Nominal Wall Thickness Advisor
- Exercise 4: Minimizing Sink Marks (1)
- Exercise 5: Minimizing Sink Marks (2)

**Lesson 5:**
**Materials**

- Material Properties
- Stages in the Process
- User-defined Database
  - Material
- Resin Properties
- Temperature Properties

- Melt Temperature
- Mold Temperature
- Part Ejection Temperature
- Glass Transition Temperature

Heat Transfer Properties
- Specific Heat
- Thermal Conductivity

Viscosity
PVT Data
Mechanical Properties
- Thermal Expansion Coefficient
- Elastic Modulus
- Poisson's Ratio

**Lesson 6:**
**Mesh Manipulation**

Mesh Manipulation
Stages in the Process
Local Refinement of Mesh
Mesh Density
Gradation
Element Issues
Mesh Editing
Mesh
Mesh Analysis
Mesh Triangles
Mesh Nodes
Leader Lines
Solid Mesh
Solid and Shell Mesh
Solid Mesh Types
- Tetrahedral Elements
- Hexahedral Elements

Exercise 6: Mesh Repairs

**Lesson 7:**
**Detecting Air Traps**

- Detecting Air Traps
- Stages in the Process
- Air Traps
  - Dieseling Effect
  - Plot Ranges
  - Thickness Analysis
- Venting
  - Venting Analysis
  - Venting Locations
- Exercise 7: Air Traps

**Lesson 8:**
**Gate Blush**

- Gate Blush
- Stages in the Process
- Runner Elements
- Domains
- Gate Blush
  - Shear Stress
  - Reducing Gate Blush

**Lesson 9:**
**Packing and Cooling Times**

- Packing and Cooling
- Stages in the Process
- Flow/Pack Switch
- Pack Stage
  - Pack Settings
- Pack Analysis
- Pack Results
- X-Y Plot
  - Volumetric Shrinkage at End of Packing
- Cooling Times
  - Temperature at Post-Filling End
  - Nodal Temperature
- Exercise 8: Packing and Cooling Times

**Lesson 10:**
**Reducing Cooling Times**

- Reducing Cooling Time
- Stages in the Process
- Multiple Injection Locations
  - Clipping Plane Mode
  - Jetting
- Exercise 9: Optimizing Cooling Time

**Lesson 11:**
**Multiple Cavity Molds**

- Multiple Cavity Molds
- Stages in the Process
- Mold Layouts
- Channel Design
- Runner Channel Design
  - Runner Types
  - Element Count
  - Searching for Polymers
- Runner Wizard Channel Design
- Family Mold Layout
- Using Runner-Balancing
- Exercise 10: Multiple Cavity Molds
- Exercise 11: Runner-Balancing

**Lesson 12:**
**Symmetry Analysis**

- Symmetry Analysis
- Stages in the Process
- Case Study l
- Case Study2
- Symmetry Face

**Lesson 13:**
**Valve Gates and Hot Runners**

- Valve Gates and Hot Runners
- Stages in the Process
- Hot Runners

Valve Gates

**Lesson 14:**
**Reaction Injection Molding**

- Reaction Injection Molding
- Stages in the Process
- Reaction Injection Molding

**Lesson 15:**
**Using Inserts**

- Using Inserts
- Stages in the Process
- Cavities and Inserts
- Materials for Inserts
  - Insert Settings
  - Hiding Cavities and Inserts

**Lesson 16:**
**Multi Shot Mold**

- Multi Shot Mold
- Stages in the Process
- Multi Shot Mold
  - Domain Order

**Lesson 17:**
**Gas Assistance Molding**

- Using Inserts
- Stages in the Process
- Gas Assist
  - Material Selection

**Lesson 18:**
**Cooling Analysis**

- Cooling Analysis
- Stages in the Process
- Cooling
- Cooling Channels and Mold Bodies. .

- Coolant
- Mold
- Cool Settings
- Cooling Simulations
  - Cool Flow Field
  - Cool Pipe
  - Coolant Entrance
  - Mold Wall Temperature
- Cool Analysis
  - Cool
- Cool Results
- Baffle
- Bubbler
- Exercise 12: Cooling Analysis

**Lesson 19:**
**Warpage Analysis**

- Warpage Analysis
- Stages in the Process
- Shrinkage
  - Reducing Shrinkage
- Warpage
- Warp Settings
- Warp Results
- Reducing and Fixing Warped Pails
  - Thermal Contributions to Warping
  - Typical Warp Shapes
  - Residual Stress