

# **Additive Manufacturing Course Syllabus**

## **Instructor**

Mr. Andrew Gunderson  
218-336-8830 x2394  
Andrew.Gunderson@isd709.org

Mr. Donald Simons  
218-336-8700 x 2243  
Donald.Simons@isd709.org

## **Course Description**

Solidworks is a CAD software that facilitates the construction of 3D models and drawings to enable production. These systems are usually designed to be used in conjunction with Subtractive Manufacturing (SM) and forming processes. This is due to the enormous portion of world-wide production in which these two processes are used. Because of this, design guidelines are customarily based on the abilities and constraints of conventional manufacturing processes. Additive Manufacturing (AM) replaces these with a new set of advantages and limitations that should be considered to assist in the design of parts. Design for Additive Manufacturing (DfAM) represents a methodology which closely resembles Design for Assembly (DFA) and Design for Manufacturing (DFM), as far as reducing component count and allow for easier manufacturing. The aim of this research is to establish DfAM criteria and to evaluate the core Solidworks software in its ability to support design using these criteria. DfAM criteria is sub-divided into two categories. Product DfAM criteria are those derived from the advantages offered by AM technology, while Process DfAM are those determined by the limitations of the AM technique used. Three example models, each addressing multiple criteria, are created in Solidworks and optimized for printing. Through this process, helpful features in the software are identified and analyzed. Embodiment of these examples by means of Fused Deposition Modeling (FDM) validates these features in an exemplary way and explores the integration of AM design practices in Solidworks. The results of this evaluation will allow further research into CAD support for AM, specifically with respect to Product DfAM

## **Prerequisites**

One full year Cad design and CSWA certification

## **Content and Objectives**

- Material types
- Machine types and processes
- Design for printing considerations
- Part model preparation Machine preparation
- Post printing finishing
- Slicer software features and functionality
- Software based printing aids

## **Career Content**

Students will also receive guidance exploring topics such as:

- Learning about the Engineering Design Process

- How to incorporate Design Intent into their models
- What roles engineers perform in society
- The many applications of CAD design
- How drawings act as communication between a designer and a machinist
- The many different fields of engineering students can pursue
- The post-graduation and/or career options available to students of CAD / Engineering.

## Coursework

- Assignments will be given as follows:
  - Tutorial review questions
    - Each student will be provided a My.Solidworks account where they can access tutorials for different modelling topics
  - Instructional model creation
    - Each chapter of our text has an instructional model that the book guides students through making
  - End of chapter models
    - Students apply the concepts they learned in the chapter to create CAD models independently
  - Other assigned models
    - Some additional models will be assigned when necessary to fully develop student understanding of concepts that are not sufficiently accomplished with just the end of chapter models
  - Measurements from created models:
    - Mass
    - Volume
    - Surface Area
  - Engineering Drawings derived from created models
  - Assemblies of Model Parts
  - End of Chapter Quizzes
    - These will be open book, providing students a chance to review the concepts they learned in the chapter and show their understanding
- Students will have an opportunity to submit any part model a second time to make corrections and improve their score

## Evaluation

- Tutorial review questions and chapter quizzes will be graded based on a percentage of correct responses
- Measurements and calculation assignments will be graded on a percent correct basis as well
  - A second attempt will be provided for students who correct and resubmit their model. They will also have the opportunity to retake the measurements from that model.

## Grading:

- **A:** 100 – 90%
- **B:** 89 – 80 %
- **C:** 79 – 70%
- **D:** 69 – 60%
- **F:** 59 – 0%