



Wohlert's Associates, Inc.  
**Three-Day DfAM Course Outline**

| Date        | Topic                                     | Details   |
|-------------|---|---|
| Day 1       |   |   |
| 8:00-8:15   | Introduction                              | Introduction to the course and attendees.   |
| 8:15-9:15   | State of the AM industry                  | Recent AM growth trends and developments around the world.  |
| 9:15-9:45   | Introduction to design for AM             | Benefits of AM in the context of DfAM, how AM is being applied, and how certain parts can be designed for AM.   |
| 9:45-10:15  | Break                                     |   |
| 10:15-10:45 | Introduction to design for AM (continued) | Continuation of previous session.   |
| 10:45-11:45 | AM process: from CAD to part              | Examining the complete AM process chain, from CAD part creation, to part production. Attendees will gain an understanding of the entire process chain and how it helps them to design better AM parts. It includes file formats and working with STL manipulation software. |
| 11:45-12:30 | Lunch                                     |   |
| 12:30-2:00  | AM design optimization exercise           | Thought processes behind DfAM. In this exercise, participants will design a hydraulic manifold while considering print orientation and support material.  |
| 2:00-2:30   | Break                                     |   |
| 2:30-3:00   | Metal AM build simulation                 | Risks of build failure can be reduced using distortion simulation software.   |
| 3:00-4:00   | Design for mass-customization exercise    | Hands-on exercise to design a custom product using a combination of CAD, 3D scanning, and STL editing software. This exercise introduces attendees to working with multiple software tools and technologies to produce custom parts optimized for AM.                       |
| Day 2       |   |   |
| 8:00-9:30   | Designing for metal AM                    | Specific issues and guidelines around designing for metal AM, including anisotropy, process constraints, general guidelines related to wall thicknesses, hole sizes, tolerances, angles, etc. A close look at metal AM post-processing and material properties.             |
| 9:30-10:00  | Break                                     |   |
| 10:00-10:45 | Lattice structure exercise                | A solid part is transformed into a shell filled with a lattice structure.   |
| 10:45-11:30 | Designing for metal AM (continued)        | Continuation of previous session.   |
| 11:30-12:15 | Lunch                                     |   |

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| Day 2 (continued) |                                    |  |
| 12:15-1:00        | Economics of AM                    | When does it make sense, or not make sense, to use AM for production quantities? What determines AM costs and how are parts designed to minimize cost?   |
| 1:00-1:45         | Designing for polymer AM processes | Specific issues and design guidelines surrounding polymer AM (material extrusion, LS, SL, etc.), including post-processing.  |
| 1:45-2:10         | Break                              |  |
| 2:10-4:00         | Topology optimization              | Designing topology-optimized parts for AM, and creating light-weight parts using software such as Inspire from solidThinking. The workflow of topology optimization, setting up multiple load-cases, and then using the generated ideas to produce a final design. |
| Day 3             |                                    |  |
| 8:00-8:45         | Tooling applications of AM         | AM beyond direct part production: Tools for injection-molding, sheet-metal forming, cutting and drilling, extrusion, jigs and fixtures, etc. Adding fixtures to parts to ease mounting on CNC machines for more efficient post-processing.                         |
| 8:45-9:30         | Part consolidation exercise        | Hands-on exercise on the implications of part consolidation for AM.  |
| 9:30-9:45         | Break                              |  |
| 9:45-11:30        | Putting it all together            | Hands-on exercise on designing a product that can be printed in metal with minimal support material and post-processing. The exercise applies what has been learned over the past three days.  |
| 11:30-12:15       | Lunch                              |  |
| 12:15-1:15        | DfAM expert panel session          | A group of AM experts offer opinions and answer questions from participants.   |
| 1:15-1:45         | Break                              |  |
| 1:45-2:45         | AM in the future                   | Looking at where AM and design software tools are headed in the future and how they may impact DfAM.   |
| 2:45-3:00         | Conclusion                         | Closing comments and distribution of certificates of completion.   |

