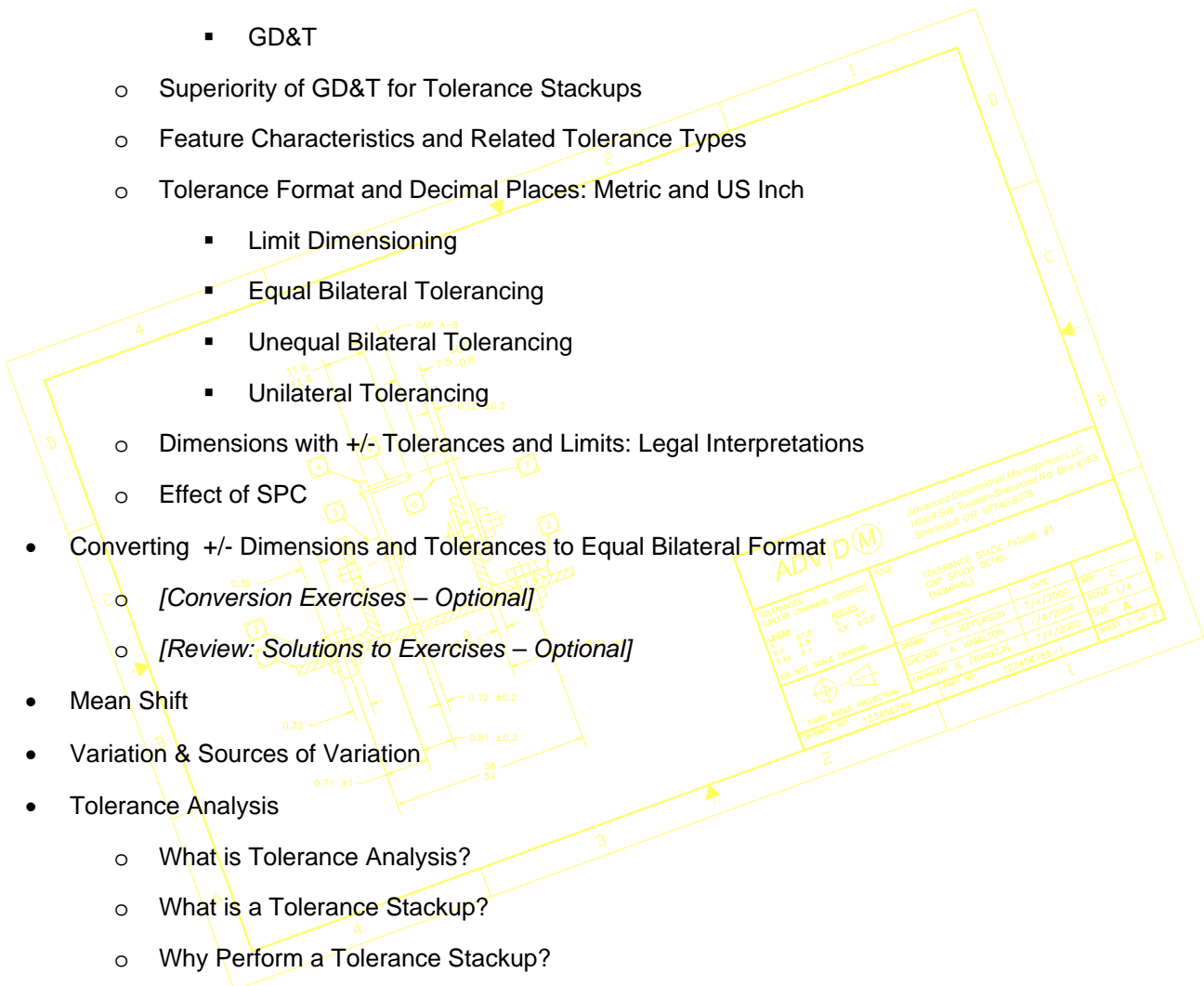
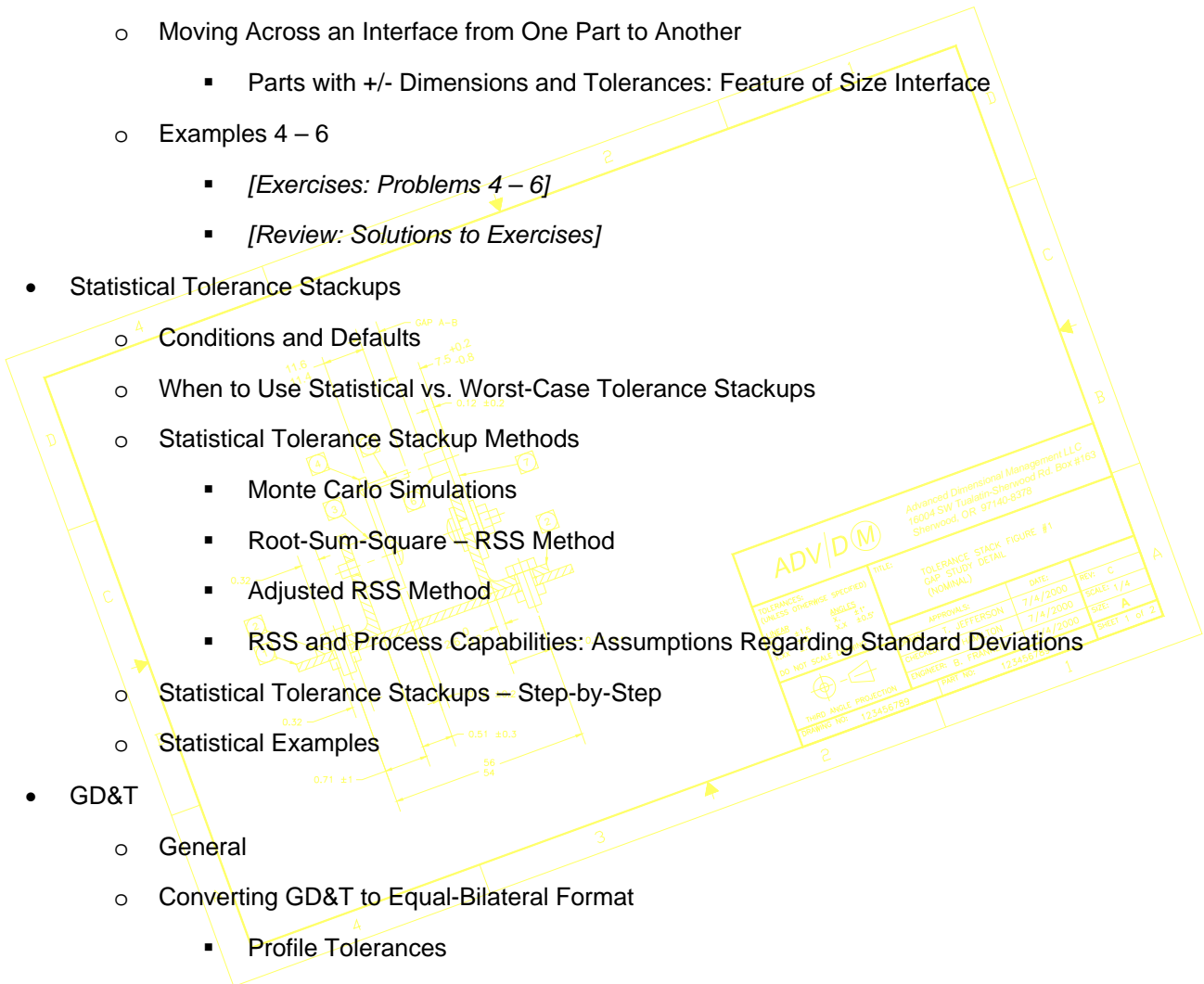


Level 1 Tolerance Analysis Course Outline – GD&T & Plus and Minus Techniques

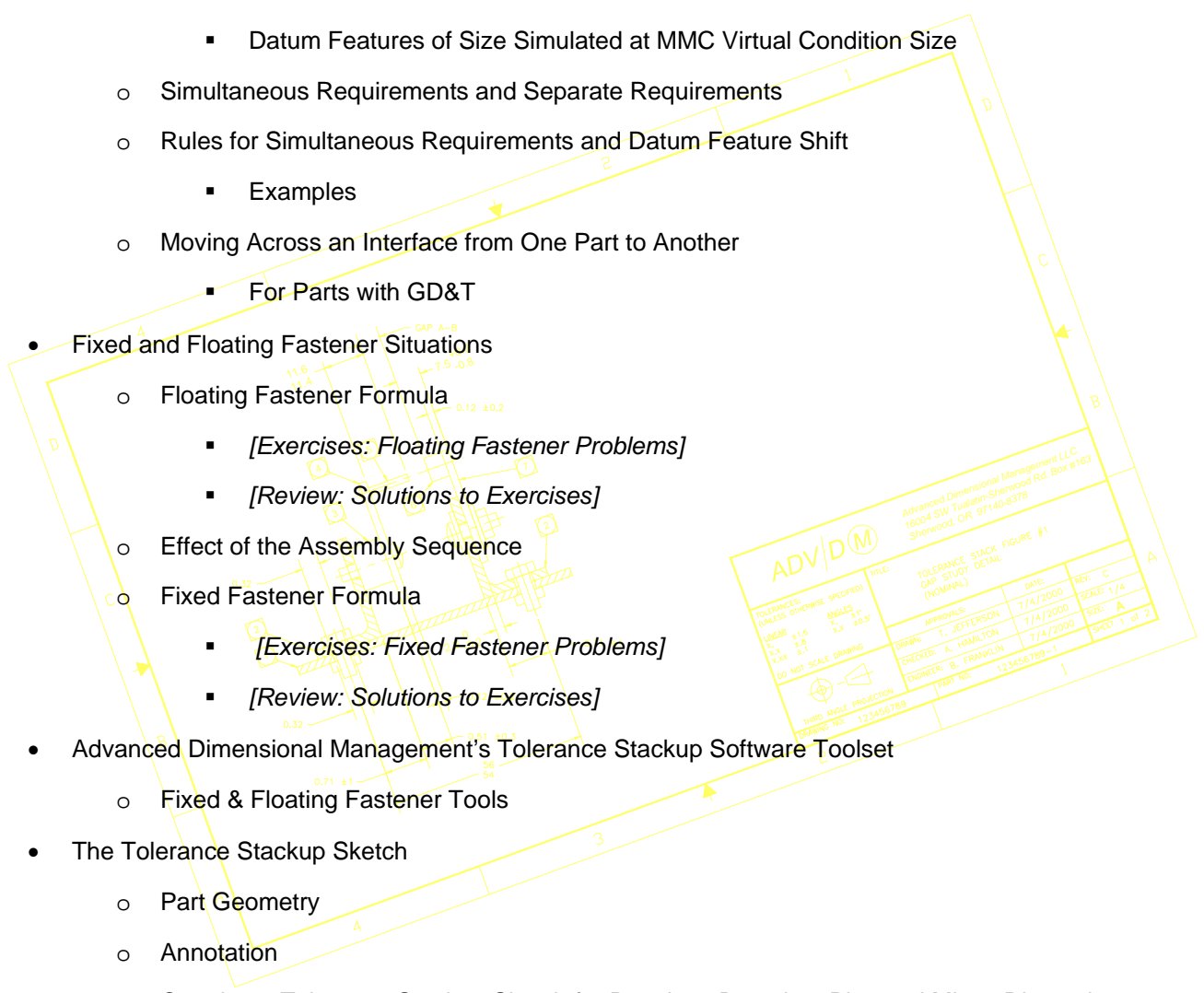
- Background
- Dimensioning and Tolerancing (US Inch and Metric)
 - Types of Dimensions
 - Types of Tolerances
 - Plus and Minus
 - GD&T
 - Superiority of GD&T for Tolerance Stackups
 - Feature Characteristics and Related Tolerance Types
 - Tolerance Format and Decimal Places: Metric and US Inch
 - Limit Dimensioning
 - Equal Bilateral Tolerancing
 - Unequal Bilateral Tolerancing
 - Unilateral Tolerancing
 - Dimensions with +/- Tolerances and Limits: Legal Interpretations
 - Effect of SPC
- Converting +/- Dimensions and Tolerances to Equal Bilateral Format
 - [Conversion Exercises – Optional]
 - [Review: Solutions to Exercises – Optional]
- Mean Shift
- Variation & Sources of Variation
- Tolerance Analysis
 - What is Tolerance Analysis?
 - What is a Tolerance Stackup?
 - Why Perform a Tolerance Stackup?
 - Methods of Types of Tolerance Analysis
- Worst Case Tolerance Stackups
 - Worst Case Tolerance Stackups – Step-by-step
 - The Chain of Dimensions and Tolerances
 - The Role of Assumptions in Tolerance Stackups
 - Framing the Problem: Idealization



- Moving Across an Interface from One Part to Another
 - Parts with +/- Dimensions and Tolerances: Planar Interface
- Examples 1 – 3
 - [Exercises: Problems 1 – 3]
 - [Review: Solutions to Exercises]
- Assembly Shift
- Moving Across an Interface from One Part to Another
 - Parts with +/- Dimensions and Tolerances: Feature of Size Interface
- Examples 4 – 6
 - [Exercises: Problems 4 – 6]
 - [Review: Solutions to Exercises]
- Statistical Tolerance Stackups
 - Conditions and Defaults
 - When to Use Statistical vs. Worst-Case Tolerance Stackups
 - Statistical Tolerance Stackup Methods
 - Monte Carlo Simulations
 - Root-Sum-Square – RSS Method
 - Adjusted RSS Method
 - RSS and Process Capabilities: Assumptions Regarding Standard Deviations
 - Statistical Tolerance Stackups – Step-by-Step
 - Statistical Examples
- GD&T
 - General
 - Converting GD&T to Equal-Bilateral Format
 - Profile Tolerances
 - Equal-Bilateral Profile Tolerances
 - Unequal-Bilateral Profile Tolerances
 - Unilateral Profile Tolerances
 - Positional Tolerances
 - Effect of Material Condition Modifiers
 - RFS



- LMC & MMC
 - Bonus Tolerance
 - Conversion Examples
- Misalignment Studies @ MMC & LMC
- Datum Feature Shift
 - Datum Features of Size Simulated at MMC Size
 - Datum Features of Size Simulated at MMC Virtual Condition Size
- Simultaneous Requirements and Separate Requirements
- Rules for Simultaneous Requirements and Datum Feature Shift
 - Examples
- Moving Across an Interface from One Part to Another
 - For Parts with GD&T
- Fixed and Floating Fastener Situations
 - Floating Fastener Formula
 - [Exercises: Floating Fastener Problems]
 - [Review: Solutions to Exercises]
 - Effect of the Assembly Sequence
 - Fixed Fastener Formula
 - [Exercises: Fixed Fastener Problems]
 - [Review: Solutions to Exercises]
- Advanced Dimensional Management's Tolerance Stackup Software Toolset
 - Fixed & Floating Fastener Tools
- The Tolerance Stackup Sketch
 - Part Geometry
 - Annotation
 - Creating a Tolerance Stackup Sketch for Drawings Based on Plus and Minus Dimensions and Tolerances
 - Creating a Tolerance Stackup Sketch for Drawings Based on GD&T
- The Tolerance Stackup Report
 - Advanced Dimensional Management's Tolerance Stackup Report Form
 - General Guidelines for Entering Data into the Tolerance Stackup Report Form



- Plus and Minus Dimensions and Tolerances
- GD&T
- Tolerance Stackup Units
- Tolerance Stackup Direction
- Tolerance Stackups Solved Using the Advanced Dimensional Management Method
 - Sample Drawing and Assembly Review
 - Tolerance Stackup Examples
 - [Exercises: Solving Problems Using Advanced Dimensional Management's Tolerance Stackup Software Toolset]
 - [Review: Solutions to Exercises]²
- Recap and Review
- Conclusion

