Mechanical Design Engineering Services from Dynamic Design Consulting

Better Designs. Better Drawings. Better Parts.™

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DYNAMIC DESIGN CONSULTING

DYNAMIC DESIGN CONSULTING, LLC

www.dynamicdesignconsulting.com

Overview of Services

Dynamic Design Consulting provides a variety of engineering services that will help your organization achieve your mechanical design vision while saving money. Our emphasis is on clear explanations of engineering standards and practical application of their concepts. The core offerings of services are listed below.

Consulting

Our consulting staff can either extend your team's capabilities or function as your engineering department. Our specialties include mechanical design and documentation. Our staff will help you understand and follow good design principles resulting in a robust design with a good documentation package for fabrication.

Training

At Dynamic Design Consulting, training is the core of what we do. We offer several courses for those seeking continuing professional education training. Our courses are developed by us and may be customized to suit your needs. We deliver training at your site or online and can use your drawings and parts.

Textbooks

We offer several mechanical engineering books, with a primary emphasis on design. These books are intended for both the student and the practicing engineer. Each is also available as an e-book download.

Instructor Resources

Whether your students are in vocational school, community college, associates or bachelor's degrees programs, or practicing professionals, reaching them takes more than subject matter knowledge. We offer resources for you to deliver training using lessons that flow logically, with good visual aids, useful handouts, and meaningful application practice exercises.

Consulting

Our engineering design & drawing services can be extremely helpful for organizations who need to identify design, drafting, dimensioning and tolerancing errors or omissions before issuing engineering drawings. The engineering design & documentation stage is very important and ultimately influential in the end-product cost, quality, and time to market. Designs must be created based on achieving functional requirements, manufacturability, and quality. We will review your designs and drawings for accuracy, completeness, and manufacturability.

We provide, for example, the following services:

Design for Manufacturability & Assemblability Review

Is that working prototype just not right for high-volume production? We will review your designs to identify opportunities to simplify product structure, reduce part count or part variety, or simplify the assembly process. Critical components are assessed for opportunities to change manufacturing methods or materials. Using the guidance of a tolerance analysis, part feature tolerances are assessed for manufacturability. We work with your suppliers to solicit and review feedback on manufacturing process plans and identify opportunities to simplify part processing.

Tolerance Analysis

Are you struggling to understand or justify tolerance choices? We will review your assembly models and interact with your engineering groups to understand the functional assembly interfaces and the assembly process. Designs will be assessed for fit without interference or undue clearance, and whether the assembly accuracy achieved meets its requirements. A comprehensive set of tolerance analyses covering mechanical fit and performance requirements will be provided. Changes are recommended where necessary.

Consulting

Drawing Creation

Do you need to supplement your current drawing creation capabilities? We will review your CAD models and interact with your engineering groups to understand the functional assembly interfaces and the assembly process. Datum features will be identified in the proper order and qualified relative to preceding datums based on part function and assembly. Features will be dimensioned & toleranced in accordance with ASME Y14.5-2018 to clearly define appropriate limits on all applicable variation. Tolerance analyses will be performed as necessary to verify the appropriateness of, and to optimize, tolerance choices.

Drawing Checking

Are you unsure if your drawings will result in good parts? Are you building or augmenting your internal drawing capabilities or outsourcing drawing creation services and need to keep them honest? Drawing checking services are available for mechanical drawings that include assemblies and components such as: machined, sheet metal, plastics, weldments, forgings, castings, extrusions, etc. We will ensure each drawing has appropriately-defined and qualified datum features, size tolerances and locating tolerances, and other refinements necessary to ensure both manufacturability and functionality. The result will be a complete drawing package of clearly-defined parts.

Delivery Details

We can take your design & drawing / checking work offsite and check your drawings for you. We can check in with individuals or groups online. We will do the deep work offline, then review our recommendations with you so you can feel comfortable with not only *what*, but *why*. We work with your staff, guiding and leading their efforts. Our expert services are an efficient way to augment and enhance your existing staff capabilities.

Corporate Training Courses in Mechanical Design Engineering

Let us fulfill your mechanical design engineering training needs. We offer a variety of Mechanical Design Courses, each developed by a practicing industry expert and refined through delivery and customer feedback.

Our courses are designed to give students new knowledge plus hands-on practice putting that knowledge to use. Students who attend our courses take away more than information; they learn how to correctly put new concepts into effective and productive use on the job.

Custom Course Design

Courses can be customized for your industry or your process to help students more easily apply the material. Programs can also be combined, expanded, or rearranged to meet the specific needs of your team. If you have training objectives including any topic not listed, let us create a custom training program for you.

Live, in-person training

Each training course is delivered on-site at your location. Classes consist of lots of face-to-face discussions and working sessions utilizing large format mechanical drawings and physical manufactured parts.

Online, Synchronous Instructor-Led Training

Courses are delivered in an online classroom, with live, personalized instructor-student interaction, and opportunities to work in teams to solidify knowledge and fill gaps. Students receive course workbooks (and textbooks where applicable) delivered to their locations prior to training.

Corporate Training Courses in Mechanical Design Engineering

Post-Training Performance Support

We constantly encounter poorly-defined part drawings and overly-tight tolerances. Training helps, but only about 10% of the knowledge & skill we apply on the job are gained during training. Even the best-delivered training course falls short of providing all of what we need to succeed at work. Most of what we learn comes from on-the-job practice, but for this to happen the learner must be immersed in a virtuous feedback cycle of well-meaning guidance provided by a critical mass of knowledgeable & experienced co-workers. Sadly, many organizations cannot provide this. This critical gap is bridged by Performance Support.

Performance support is working with your engineers, your designs, and your drawings. It ensures that part tolerancing is clear and functional, and that your engineers are brought along every step of the way. More than merely outsourcing engineering efforts, performance support is mentoring. Your engineering team reviews and reinforces what they have been exposed to in training, while producing high-quality results they can reproduce on their own. Let our expert work with your staff on a short-term or long-term basis to support and build their capability in dimensioning & tolerancing.

Course Delivery

Courses are typically one, two, or three days long, though custom courses can vary in length. A typical delivery schedule for live, in-person training runs 8:00am – 4:00pm at the customer's site, with a 12:00pm – 12:45pm lunch break.

Online, Synchronous Instructor-Led Training is delivered in ½-day portions, typically 9:00am – 12:30pm EST/EDT. Our preferred platform is Zoom, but courses may be delivered using the customer's preferred platform.

Basic Print Reading

Course Description

Prints are manufacturing instructions and generally contain a drawing, dimensions, and notes. Print Reading is the universal form of communication allowing the engineering department and the manufacturing department to communicate all the information that is needed to manufacture a product. Upon completion of the program, you will have gained a new set of skills for reading engineering prints.

Learning Objectives

- Interpret and describe the technical information provided on industrial prints through drawings, dimensions, and notes
- Visualize three-dimensional parts from drawings consisting of multiple views, including principal, auxiliary, partial and section views
- Determine part dimensions and tolerances including geometric tolerances
- Interpret standard surface finish symbols and screw thread designations.
- Understand drawing features, symbols and notes unique to castings, forgings, and molded part prints, welded parts, sheet metal parts, gears, splines, and cams.
- Identify relevant information from a variety of other common types of prints used to convey specific types of information.

Course Outline

- The Basics of Manufacturing Prints
- The Reading of Manufacturing Prints
- The Total Manufacturing Print
- Views
- Dimensioning Fundamentals
- Dimensioning Applications
- Size Tolerances
- Geometric Tolerances
- Surface Finish

Basic Print Reading

Course Outline, Cont.

- Threads
- Manufacturing Processes
- Casting, Forging, and Molded Part Prints
- Welding and Sheet Metal Prints
- Gears, Splines, and Cams
- Types of Manufacturing Prints

Prerequisites: None.

Course Format: 16 hours: 2 in-person sessions or 4 online sessions

Who Should Attend

This course is designed for anyone who needs to properly interpret and act upon the information contained in engineering specifications, including mechanical engineering technicians, manufacturing engineering technicians, machinists, welders, fabricators, tool & die makers, and quality assurance technicians.

Advanced Print Reading

Course Description

How to interpret a technical drawing is an essential skill to anyone involved in the manufacturing industry. This course is designed for those seeking thorough coverage of the subject of drawing interpretation. This course presents the basic elements of a print and introduces the concepts that students must master to successfully interpret engineering drawings. Designed to provide you with an awareness of GD&T fundamentals, this course focuses on the basic requirements of engineering drawings, numeric dimensions and tolerances and geometric dimensions and tolerances.

Learning Objectives

- Visualize three-dimensional parts from drawings consisting of multiple views, including principal, auxiliary, partial and section views
- Recognize the symbols used with the geometric system of tolerances and properly read feature control frames.
- Recognize and properly consider bonus tolerances, datum feature identifiers, and the datum reference frame.
- Identify and read geometric controls on location, orientation, form, profile & runout.
- Interpret standard surface finish symbols and screw thread designations.
- Understand drawing features, symbols and notes unique to castings, forgings, and molded part prints, welded parts, sheet metal parts, gears, splines, and cams.
- Identify relevant information from a variety of other common types of prints used to convey specific types of information.

Course Outline

- The Basics of Manufacturing Prints
- The Reading of Manufacturing Prints
- The Total Manufacturing Print
- Views
- Dimensioning Fundamentals

Advanced Print Reading

Course Outline, Cont.

- Dimensioning Applications
- Size Tolerances
- Geometric Tolerances
- Surface Finish
- Threads
- Machine Terms and Manufacturing Processes
- Casting, Forging, and Molded Part Prints
- Welding and Sheet Metal Prints
- Gears, Splines, and Cams
- Types of Manufacturing Prints

Prerequisites: None

Course Format: 24 hours: 3 in-person sessions or 5 online sessions

Who Should Attend

This course is designed for anyone who needs to properly interpret and act upon the information contained in engineering specifications, including mechanical engineering technicians, manufacturing engineering technicians, machinists, welders, fabricators, tool & die makers, and quality assurance technicians.

Note: This course is not intended for design engineers who need to define engineering requirements - for a more in-depth coverage of GD&T, see: Basic GD&T.

Basic GD&T

Course Description

Intended for practicing professionals who create drawing specifications or read drawings, this course helps students make sense of a topic that some find overwhelming. In this comprehensive class, the key principles are explained and brought down to the real world. The delivery includes and lots of illustrations and animations to help with conveying concepts. More than simply memorizing symbols, students leave this course with a working understanding of how the system works and feel confident fully understanding drawing requirements and creating their own tolerancing schemes for parts.

This course provides lots of practical hands-on exercises to drive home the concepts and encourage questions and effective discussions. The exercises go beyond the theory to show how tolerancing works on real working parts.

Learning Objectives

- Visualize the different types of variation that exist on parts, recognize the limitations of numeric tolerances and understand the need for geometric tolerances.
- Analyze tolerances expressed numerically and calculate minimum and maximum allowable values for dimensions.
- Understand and apply the symbols used with the geometric system of tolerances.
- Recognize basic dimensions on prints and properly interpret their meaning.
- Properly evaluate inspection data in light of tolerance zones defined by geometric controls.
- Apply tolerances with bonus when suited to the application and properly interpret tolerances when bonus tolerance applies.
- Identify and properly interpret geometric controls on location, orientation, form, profile & runout.

Basic GD&T

Learning Objectives, cont.

- Recognize datum feature identifiers applied to features with size and surfaces.
- Identify and interpret the datum reference frame including order of precedence.
- Create specifications using appropriate geometric tolerances and datum reference frames.

Who Should Attend

This course is designed for anyone in engineering, manufacturing, and quality assurance who need to define engineering requirements with drawings, or properly interpret and act upon the information found in engineering drawings

Prerequisite: A Basic Print Reading workshop/course is recommended as a prerequisite. The Basic GD&T course does not review general print-reading concepts such as views, title blocks, and notes. Students who have become familiar with finding and understanding information on prints through on-the-job experience will be prepared for this course.

Course Format: 24 hours: 3 in-person sessions or 5 online sessions

Advanced GD&T

Course Description

Even with an understanding of the fundamentals of GD&T, many professionals still lack the confidence to expertly and deliberately apply geometric tolerancing to clearly define their product designs. Like with any language, this deeper understanding is built off the fundamentals.

The Advanced course helps students apply GD&T to achieve the mating and functional requirements of their parts. This course reinforces fundamentals and provides applications-based exercises where students apply what they have learned. Application practice exercises and calculations are performed individually and in teams. The use of functional dimensioning and tolerancing schemes and its effect on assemblies is emphasized throughout the course. Students will expand their understanding of the implications of their specifications on function, manufacturing, inspection, and quality. Students will gain experience and confidence selecting the product definition strategy for an assembly by working more advanced application examples with their peers under the guidance of an expert in a classroom setting.

Learning Objectives

- Deepen your understanding of geometric controls by analyzing inspection data to verify features conform to drawing specifications
- Apply the geometric language to real parts
- Specify datum reference frames properly to represent the part's functional requirements, including the use and interpretation of datum shift where appropriate
- Apply geometric controls and symbols properly to suit the mating and functional requirements
- Practical and useful symbols, modifiers, and notations not typically presented in basic courses
- Thoroughly and completely define geometric requirements on a variety of engineering drawings

Advanced GD&T

Who Should Attend:

This course is designed for anyone in engineering, manufacturing, and quality assurance who need to define engineering requirements with drawings, or properly interpret and act upon the information found in engineering drawings.

Course Outline

- Basic GD&T Review
- Advanced Datum Reference Frame Concepts
- Profile Control Concepts
- Position Control Concepts
- Boundaries

Prerequisites: At least one Basic GD&T course is required as a prerequisite. It's essential that individuals understand the underlying principles that the Basic course is focused on teaching. In addition, students should have at least 1 year of on-the-job experience applying and / or interpreting GD&T.

Course Format: 16 hours: 2 in-person sessions or 4 online sessions

Applications of GD&T

Course Description

This course helps students apply GD&T to achieve the mating and functional requirements of their parts using a series of case study problems including sheet metal, machined parts, plastic parts, castings etc. Light on lecture and heavy on participation, calculations and exercises are performed individually and in teams. This course provides realistic design problems where students apply what they have learned while reinforcing their understanding of the fundamentals.

Learning Objectives

- Calculate linear, axial and orientation stack-ups using parts with geometric tolerancing
- Perform tolerance stack-up analysis to assign critical tolerances
- Combine the effects of different types of variation using the concept of boundaries, calculate boundary sizes and use boundaries properly in stack-up analysis
- Apply the geometric language to real parts
- Construct the appropriate functional datum reference frames for parts after analyzing the mating requirements
- Apply datum feature modifiers where appropriate based on analyzing the requirements
- Apply geometric tolerancing to control features and ensure mating requirements are met

Applications of GD&T

Who Should Attend

This course is designed for mechanical design engineers and engineering technicians supporting them in the design of mechanical components and definition of engineering requirements.

Course Outline

- Linear Stack-Ups
- Stack-Ups Involving Profile, Flatness, and Perpendicularity
- Boundaries
- Axial Stack-Ups via Boundaries
- Orientation
- Application Practice Exercise
- Machined part exercise
- Two-piece turned part exercise
- Three-piece round machined part exercise
- Two-piece machined part exercise
- Seven-piece round machined part exercise

Prerequisites: Basic GD&T, Advanced GD&T, or the equivalent.

Course Format: 24 hours: 3 in-person sessions or 5 online sessions

Introduction to Design for Manufacturing and Assembly

Course Description

Design for Manufacturing and Assembly (DFMA) is a set of overlapping principles applied to engineering design that consider requirements beyond the functional. DFA ensures a good design early in the design process by focusing on the number of parts, part handling, and ease of assembly. DFM achieves good product designs using simple manufacturing techniques and using standardized parts and materials. Together DFMA helps organizations reach the goal of developing quality products at the lowest cost while saving time. This 3-day workshop will provide you with fundamental knowledge and hands-on practice with Design for Manufacturing and Assembly (DFMA) principles and key tools.

Learning Objectives

- Understand how DFMA impacts product cost and quality.
- Learn the principles of design for assembly for mechanical products.
- Identify ways to simplify your product and dramatically reduce part count.
- Use step-by-step procedures for analyzing and improving DFA including design for handling, presentation, orientation, insertion, fastening, and mistake-proofing for design and process elements.
- Obtain detailed guidelines of DFM covering fabrication processes and see examples of good and bad design for manufacturability.
- Apply DFM principles and general tolerancing recommendations on the most pervasive manufacturing processes, including machining, metal forming, injection molding, casting, additive manufacturing, etc.
- Conduct process capability studies to optimize design and manufacturing targets.
- Analyze and assign appropriate tolerances for new designs.
- Review drawings for proper use of Geometric Dimensioning and Tolerancing to increase tolerances and reduce cost without compromising product function.
- Apply a practical methodology for analyzing & improving the manufacturability of your company's products.

Introduction to Design for Manufacturing and Assembly

Who Should Attend

This course is designed for all levels of engineering and manufacturing personnel, as well as their managers. Anyone involved in design or manufacturing - including design engineers, product engineers, manufacturing engineers, process engineers, and quality engineers - will take away valuable skills and knowledge.

Course Outline

- Introduction
- Design for Assembly
- Design for Automated Assembly
- Design for Manufacturing
- Design for Machining
- Design for Metal Forming
- Design for Injection Molding
- Design for Casting
- Design for Welding
- Design for Surface Treatment
- Design for Additive Manufacturing
- Process Capability and Tolerances
- GD&T for DFMA
- DFMA And the Development Process

Prerequisites
None.

Course Format
24 hours: 3 in-person sessions.

1-Day GD&T Primer

Course Description

Intended for the professional or manager seeking an awareness of dimensioning and tolerancing who does not need to further their knowledge with a more in-depth course. Designed to provide you with an awareness of GD&T fundamentals, this course focuses on the basic requirements of engineering drawings, numeric dimensions and tolerances and geometric dimensions and tolerances.

Learning Objectives

- Calculate minimum and maximum allowable values for dimensions considering numeric tolerances.
- Learn how geometric tolerances supplement conventional tolerances to specify limits on allowable variation.
- Recognize the symbols used with the geometric system of tolerances.
- Recognize basic dimensions on prints and understand their meaning.
- Identify and properly read feature control frames.
- Recognize when bonus tolerance is available and calculate geometric tolerance values when bonus tolerance applies.
- Recognize datum feature identifiers applied to features with size and surfaces.
- Analyze the datum reference frame including order of precedence.
- Identify and read geometric controls on location, orientation, form, profile & runout.

Who Should Attend

This course is designed for engineering managers and supervisors, mechanical engineering technicians, manufacturing engineering technicians, quality assurance technicians, and supplier quality engineers.

1-Day GD&T Primer

Course Outline

- **The Basics of Manufacturing Prints:** What manufacturing prints are and why they are used. Who uses them and how. The manufacturing cycle and purpose of prints. The basic requirements of technical drawings.
- **Dimensions:** Fundamental dimensioning and tolerancing rules. Symbols associated with dimensions. Linear, diametral, radial, and angular dimensions. Dimensioning of common features.
- **Numeric Tolerances:** The ways numeric tolerances are indicated on prints. Determining tolerance values for numeric tolerances given implicitly, explicitly, symbolically, and by limit dimensioning.
- **Geometric Tolerance Fundamentals**: How geometric tolerances work. Thinking of parts as collections of features not dimensions. Features with size and surfaces. Maximum Material Condition and Least Material Condition. What bonus tolerance is and when it applies.
- **The Datum Reference Frame Concept:** The purpose of a datum reference frame. Establishing datums from various datum features. What datum shift is and when it applies.
- **Interpretation of Geometric Controls:** The geometric characteristic symbols used to impose geometric requirements.

Prerequisites
None.

Course Format
8 hours: 1 in-person session or 2 online sessions

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1-Day GD&T 2018 Update

Course Description

Though released in 2019, the most current standard defining dimensioning and tolerancing practices and their interpretation carries the ASME Y14.5-2018 designation. A revision of ASME Y14.5-2009, it contains many clarifications and improvements on the standard it replaces. Important changes include: concept of feature of size; datum references and degrees of freedom; composite position tolerances; surface boundaries and axis methods of interpretation; profile tolerances; and symbology and modifier tools. This course highlights the most significant of these changes and provides answers to your questions on the added, changed, and deleted content as compared to the previous revision. Don't be left behind following outdated standards, get current with the GD&T ASME Y14.5-2018 update.

Learning Objectives

- Apply and properly interpret profile tolerances in various forms, across a wide variety of applications
- Properly interpret specifications such as radius and controlled radius, confidently in accordance with the standard, instead of via assumption
- Properly interpret datum feature identifiers applied to surfaces, and specify planar datum features
- Apply alternatives to concentricity and symmetry with deep understanding of the geometric controls available to locate features
- Recognize where ambiguity exists on drawing specifications and learn strategies for dealing with it

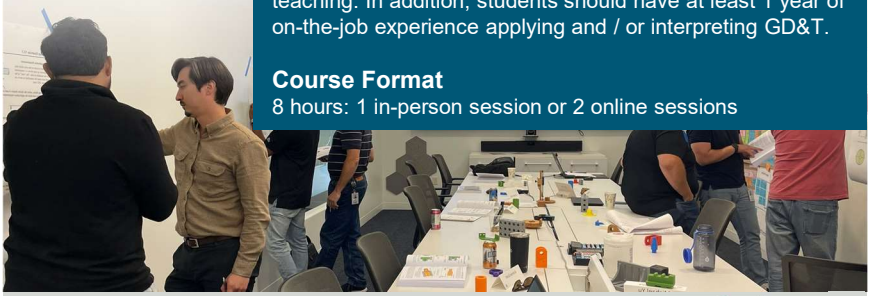
Who Should Attend

This course is designed for mechanical design engineers and engineering technicians supporting them in the design of mechanical components and definition of engineering requirements.

1-Day GD&T 2018 Update

Course Outline

- **Changes to language and terminology**: Angularity, Least material boundary, Datum target, Feature, Free state, Irregular feature of size, Runout
- **Added Definitions**: Common datum, Continuous feature, Continuous feature of size, Interruption, Represented line element, Restrained, True geometric counterpart
- **Deleted terms**: Concentricity, Free state variation, Restraint, Symmetry, Theoretical datum feature simulator
- **Additions to the standard**: Non-uniform profile using the from-to symbol, Relaxation of size requirements using the dynamic profile symbol
- **Expansion and clarifications of the standard**: Restrained condition and free state modifier, Continuous feature, Radius, Controlled radius, Profile in a note, Runout
- **Changes to interpretation**: Default stabilization for datums, Surface interpretation vs. Axis interpretation for position at MMC
- **Deletions from the standard**: Concentricity and symmetry, Graphical representation of unequally disposed profile
- **Emphasis shift**: Ambiguity of plus/minus tolerancing applied to surfaces, Expanded use of model-based dimensioning and tolerancing



Prerequisites
At least one Basic GD&T course is required as a prerequisite. It's essential that individuals understand the underlying principles that the Basic course is focused on teaching. In addition, students should have at least 1 year of on-the-job experience applying and / or interpreting GD&T.

Course Format
8 hours: 1 in-person session or 2 online sessions

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Introduction to ISO-GPS Tolerancing

Course Description

Intended for practicing professionals who create drawing specifications or read drawings, this course helps students make sense of a topic that some find overwhelming. In this class, the key principles of ISO Geometrical Product Specifications (GPS) are explained and brought down to the real world. The includes lots of color illustrations and animations to help with conveying concepts. More than simply memorizing terms and symbols, students leave this course with a working understanding of how the system works and feel confident fully understanding drawing requirements and creating their own tolerancing schemes for parts.

Learning Objectives

- Describe the ISO standards system on technical drawings
- Recognize ISO drawing practices
- Explain the structure of GPS and the domains of features
- Recognize the symbols used in geometrical tolerancing
- Describe linear size and size conditions
- Explain the principle of independency and the envelope requirement
- Explain geometrical tolerancing concepts: MMR, LMR, RPR, virtual conditions, and collective requirements
- Describe the ISO 286 system of limits and fits
- Describe the datum system (planar datums)
- Interpret datum target and size datum specifications
- Interpret the flatness, straightness, roundness, cylindricity, perpendicularity, angularity, and parallelism tolerances
- Explain the fundamental concepts of position tolerances
- Interpret the position tolerance at MMR and special applications
- Interpret the coaxiality, concentricity, symmetry, circular and total run-out tolerances
- Interpret the profile any surface and profile any line tolerances
- Explain the ISO system for general tolerances
- Interpret work piece edge specifications
- Interpret surface texture and surface imperfection requirements

Introduction to ISO-GPS Tolerancing

Course Outline

- **ISO Standards and Drawing Conventions**: Orthographic projection, display of dimensions, drawing notes, title blocks & other components
- **GPS Basics**: What is GPS, features, three domains, geometrical symbols, common symbols, tolerance zones, tolerance frames
- **Size, Feature of Size**: MMS and MMC, LMS and LMC, RFS and RFS rules; the independency principle and the envelope requirement; MMR, MMR rules, MMVC, LMR, LMR rules, LMVC, RPR, RPR rules
- **Limits and Fits (ISO 286)**: System of limits and fits and its use
- **The Datum System**: The role of datums, planar datums, restricting degrees of freedom, sequence, common datum features
- **Size Datum Features**: Datum indications, datum axis RFS, datum median plane RFS, datum axis MMR, datum median plane MMR
- **Tolerances of Form**: Controls of flatness, straightness, roundness and cylindricity; envelope & independency effects
- **Orientation Tolerances**: parallelism, perpendicularity, and angularity, applied to integral feature, feature of size RFS, feature of size MMR
- **Datum Targets and Irregular Datum Surfaces**: Datum Targets, types of datum targets, symbols, target simulations
- **Tolerances of Profile**: Profile any surface, profile any line, tolerance zones, uses for each, applications of profile tolerances
- **Position Tolerance**: RFS, implied TEDs, advantages of position tolerances, modifier usage, uses for a position tolerance, MMR, LMR, RPR, collective requirements, projected tolerance zone
- **Coaxiality**: Concentricity, symmetry, tolerance zones,, RFS / MMR effects; circular run-out, total run-out, tolerance zones
- **ISO General Linear and Angular Tolerances (ISO 2768)**: Specification of tolerance class, workpiece rejection
- **Edges of Undefined Shape (ISO 13715)**: Work piece edges, terminology, burr, passing, undercut, drawing indications / interpretation
- **Surface Texture and Surface Imperfections (ISO 1302)**: Terminology, specifications, profiles, surface imperfections, types of imperfections, parameters of a surface imperfection
- **ISO/ASME Comparison**: Major differences between ASME GD&T standard & ISO-GPS, watchouts for interpretation

Books

Hammer's Blueprint Reading Basics

Blueprints, or "prints," show what is needed to make parts. They include details such as size, shape, and acceptable variations. They also tell you the material, finish, special assembly and processing instructions, and inspection requirements. Blueprints come from engineering departments and provide all the necessary information to all those involved in making the part. They turn ideas into products, and help communicate between customers, sales, engineers, drafters, purchasers, machinists, operators, assemblers, and inspectors.

This vastly improved edition focuses even more on the end-user, with a more graphical treatment and a better balance between visualization and interpretation skills, making Hammer's Blueprint Reading Basics, 5th Edition a truly indispensable resource.

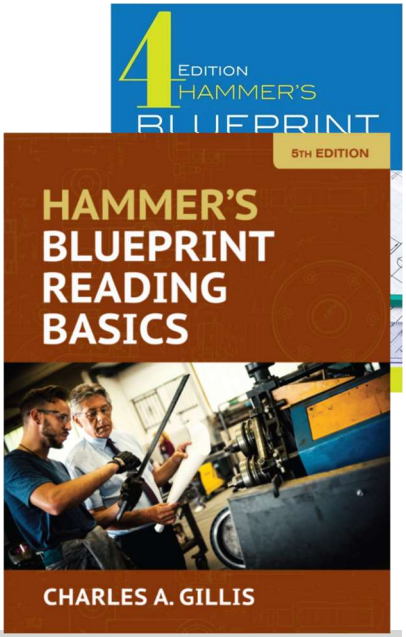
Book
https://dynamicdesignconsulting.com/products/ols/products/xn--hammers-blueprint-reading-basics---5th-edition-tm42a

E-Book
https://ebooks.industrialpress.com/product/hammers-blueprint-reading-basics

★★★★★ **Excellent product!**

4th Edition Reviewed in the United States on March 15, 2024

My Daughter needed to learn to read mechanical drawings and trying to verbally explain was more than I could handle. This Book greatly aided and accomplished that mission. Being a retired Industrial Electrician my knowledge of Mechanical Drawings is limited. However, she is now proficient and using measuring instruments in her job of inspecting parts everyday!! Thank You to the Author!!



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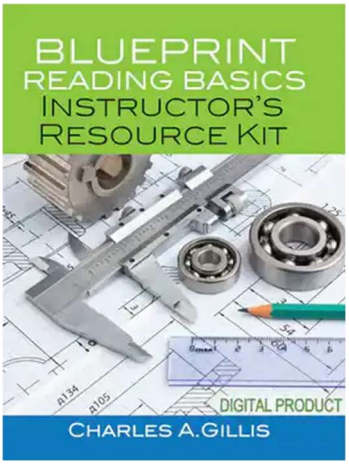
Instructor Resources

Blueprint Reading Basics Instructor's Resource Kit

The objective of the Blueprint Reading Basics Program is to produce competence in print reading for all students in the manufacturing trades. Competence enables a person to contribute effectively toward professional objectives and to produce valuable results from their efforts. Competence begins with knowledge which may be gained through reading, and skill which is acquired through practice. But competence is more than just knowledge and skill; it incorporates attitudes and behaviors that one needs to perform work functions by putting that skill and knowledge to effective and productive use.

Hammer's Blueprint Reading Basics and the Instructor's Resource Kit work together to produce true competence. Designed to work together, the Blueprint Reading Basics Instructor's Resource Kit contains:



- Over 600 PowerPoint presentation slides for using the book in the classroom. The arrangement mirrors the book and can be customized by instructors.
- Blueprint Reading Course Recommended Syllabus and Lesson Plans, to be customized to suit each instructor's needs.
- PDFs of Selected Figures and Tables.
- PDFs for Review Questions and Answers.
- PDFs for Worksheet Problems and Solutions.

Product Page: https://books.industrialpress.com/9780831136697/blueprint-reading-basics-instructors-resource-kit-digital-edition/

Instructor Resources

Blueprint Reading Basics 3D Model Kit

The *Blueprint Reading Basics 3D Model Kit* contains over 400 STL files. These model files are intended to be 3D printed and used with *Hammer's Blueprint Reading Basics, 5th Edition*, and the *Instructor's Resource Kit* to provide a hands-on learning experience. The models are representations of the parts used in the figures and worksheet exercises throughout the *Blueprint Reading Basics* Program.

The models help show the 3D geometry of 2D part drawings and reinforce student's capabilities to visualize parts from prints. The instructor can demonstrate the relationships between physical part features and their drawing representations. The use of physical models bring concepts home through visual and tactile senses, deepening understanding and retention.

The models, textbook, and other resources can all be used together or separately to provide an engaging and educational experience for students.

Stereolithography (.stl) files contain the surface geometry of a 3D object, and are the most common file format for 3D printing. STL files are compatible with nearly all 3D printers and slicer programs used to convert 3D object models into printer commands. STL files are also compatible with most 3D file viewers for on-screen display.

Product Page:
https://dynamicdesignconsulting.com/products/ols/products/blueprint-reading-basics-3d-model-kit

Testimonials

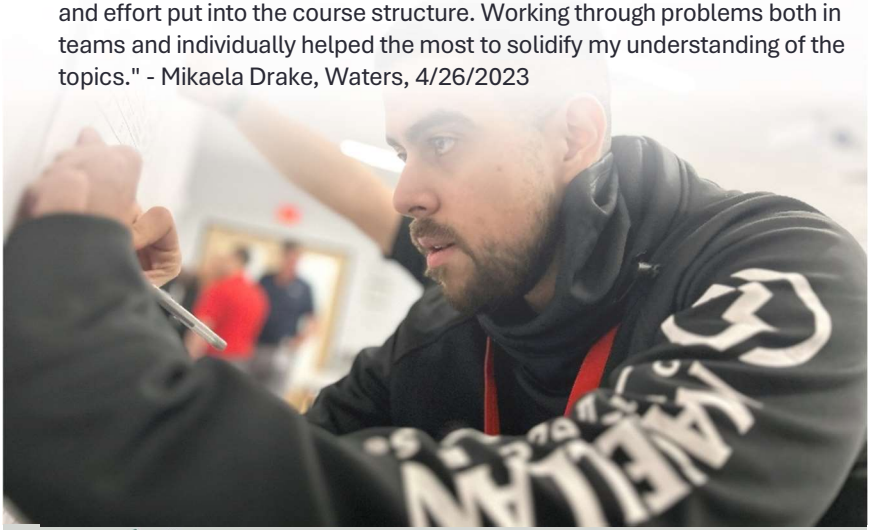
What former students have said

- "Thanks for the Advanced GD&T training. It was great to have an instructor that understands the subject exceptionally well. This class taught me new things and helped solidify my understanding in other areas." - Isaac Glenn, Northrop Grumman Corporation, 8/22/2024
- "Great class for introduction to GD&T! Followed adult learning model w/ many examples and real life application." - Glen Fantuzzi, Abiomed, 4/24/2013
- "Good training presentation flow. Good use of props and hand-drawings. Great instructor. Very patient!" - Student, Bilfinger Industrial Services Inc., 9/29/2011
- "This course was awesome! I feel like I have the confidence and resources to successfully utilize GD&T" - Hannah Neitzke, Harley-Davidson Motor Company, 10/28/2015
- "GD&T has so many symbols and terminology that as a new engineer can be extremely daunting. This class not only made me comfortable reading prints but also made me comfortable enough to implement GD&T in my future prints. Awesome class!" - Jessica Grabinsky, Smith & Nephew, 10/23/2018

Testimonials

What former students have said

- "Charles Gillis did a great job covering the GD&T course. The book was very helpful and easy to follow along. The class was surprisingly pretty exciting and unsurprisingly very informative. Definitely recommended to mechanical engineers & machinists! (I am a CNC machinist for reference)" - Mike Chase, Rexa, 4/14/2023
- "This is the second course I have had with Charles and I think his lecture and breakout group style is great. He is very knowledgeable and encourages questions to ensure that the students understand the material." - Jacob Mertins, Mack Technologies, 9/20/2022
- "Great training, learned a lot, will be able to apply to my work... very knowledgeable instructor. Thanks!" - Student, On-Line Design, 4/16/2013
- "It was an awesome experience and I would love to take more classes in the future" - Dunavan Fahey, Tegra Medical, 12/3/2018
- "I was really impressed with how well the course was designed and paced! Everything flowed very well together. I really appreciate the time and effort put into the course structure. Working through problems both in teams and individually helped the most to solidify my understanding of the topics." - Mikaela Drake, Waters, 4/26/2023



Charles A. Gillis, P.E.

Mr. Gillis has 30 years of machine design experience in industry.

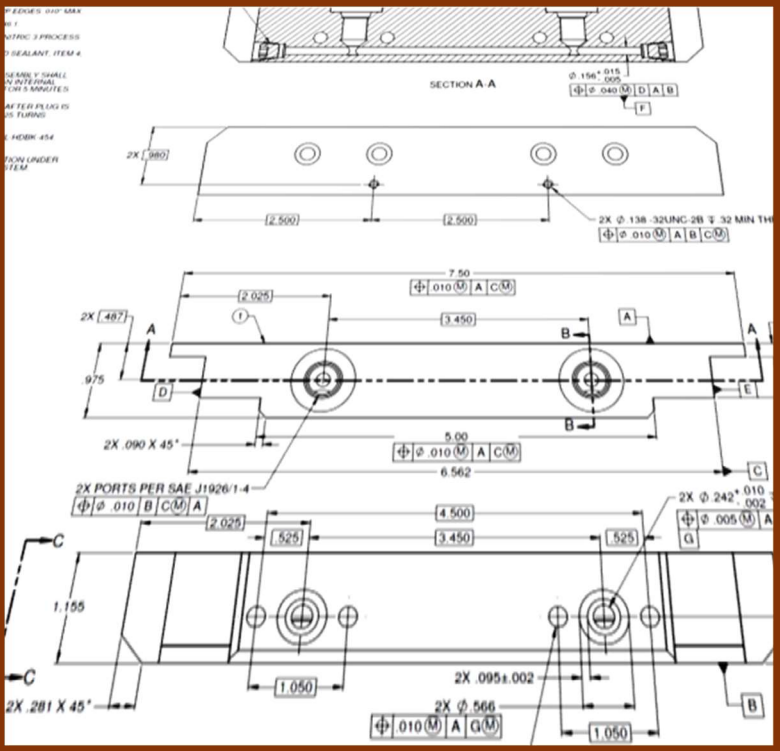
Through his work with Dynamic Design Consulting, LLC, he helps clients with product design, design for assemblability and manufacturability, design documentation, tolerance stack-up analysis, and related capability-building. He has invented and designed mechanical and electro-mechanical devices of great diversity, from high-speed, fully- automated precision mechanisms and manufacturing machinery to kinetic sculptures installed as public art.

He previously served as a mechanical design engineer for The Gillette Company, designing automated machinery for manufacturing blade and razor products. He has designed equipment to manufacture the Mach3, Venus, Sensor3, Fusion, and Embrace product lines.

He has been training practicing engineers in GD&T, Print Reading, and related mechanical design and documentation topics for 15 years.

In addition to authoring *Hammer's Blueprint Reading Basics* (Industrial Press, 2017), he is also a contributing author to *Machinery's Handbook* (Industrial Press, 2020), *Machine Designers Reference* (Industrial Press, 2011) and *The Cam Design and Manufacturing Handbook* (Industrial Press, 2002).

Charles earned his Bachelor of Science Degree in Mechanical Engineering from Worcester Polytechnic Institute, and his Master of Science Degree in Mechanical Engineering from Northeastern University. He is a licensed Professional Engineer in the Commonwealth of Massachusetts, and holder of a Geometric Dimensioning and Tolerancing Professional Certificate-Senior Level (GDTP-S) from the American Society of Mechanical Engineers (ASME).



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