For useful background materials and further information on these courses, please visit the SJSU website:
http://www.engr.sjsu.edu/bjfurman/GDTcourses/

Industry Outreach Courses for Product Design Management

GD&T

In its most elemental form, machine part geometry management is a two step process consisting of: 1) specifying the nominal - perfect - geometry of a part, and 2) specifying its permissible limits of imperfection. The first step is accomplished with the help of CAD, the second with the help of either classical or geometric tolerancing tools. Whereas the classical tools force us to rely on tribal understandings of vague propositions, the scientific rigor of Geometric Dimensioning & Tolerancing (GD&T) tools permits

- researching design functionality prior to release
- maximizing the fault tolerance of a design,
- guaranteeing assemblability of mating parts, and
- encoding the function of each feature of a part,

to provide an absolutely rigorous guide for manufacturing process selection and management, as well as mechanical inspection. Because of these strengths, GD&T, represented most importantly by the ASME Y14.5M 1994 and ISO 1101 standards, has been recognized as an essential component of cost effective product development the world over.

Seminar Leader - Bill Tandler

Bill Tandler, president of Multi Metrics, Inc., a graduate in Physics and Applied Math of the Swiss Federal Institute of Technology in Zürich, and a member of the ASME Y14.5.1 subcommittee, has spent the last ten years contributing to turning the ASME Y14.5 standard into a science, as well as refining the techniques of GD&T training.

Design for X

Product development involves not only technical design, but the management of information and competing goals. Design for X (dfX) is an integrated set of tools to help engineers and project leaders reduce the time and costs of managing this information. This allows the team to focus on creative problem-solving and technical analysis of the design. The design tools include methods such as:

- voice of customer (VOC) analysis
- failure modes and effects analysis (FMEA)
- quality function deployment (QFD)
- error-proofing & design for assembly (dfA)
- concept generation & Pugh concept selection

If you are involved as an engineer, manager, or marketing person on a development team, and are looking for new methods to help create better designs, then this course will be of benefit.

Seminar Leader - Mark Martin

Dr. Mark Martin, the president of Design4X, Inc. has worked with product development teams in the U.S., Japan, and Europe to improve their designs and product development processes. Dr. Martin received his Ph.D. in Mechanical Engineering from Stanford University, MSME and masters in Management from MIT, and BSME from the University of Oklahoma.

San Jose State University

The Mechanical and Aerospace Engineering Department at San José State University has been offering short courses to industry for over a decade. Prof. Fred Barez and Prof. Buff Furman began sponsoring Bill Tandler's Smart GD&T™ course cycle in 1998, which, hailed as the premier resource for acquiring proficiency in this critical field, has since helped some 250 local industry professionals hone their skills.

Recognizing the overarching significance of Design for X methodologies in the new product generation process, Professors Barez and Furman decided to incorporate a one-day version of Mark Martin's finely tuned course on this topic into our Winter 2002 Product Design Management series.

For useful background materials and further information on these courses, please visit the SJSU website:
http://www.engr.sjsu.edu/bjfurman/GDTcourses/
Smart GD&T™ Course Cycle

**What is Smart GD&T?**

Smart GD&T is a rigorous, rule-based approach to implementing the ASME Y14.5 1994 standard. The Smart GD&T™ course cycle leads to substantial proficiency in the application of GD&T by providing clear, conceptual underpinnings and highly organized processes. Consisting of a Beginning, an Intermediate, and two Advanced sessions, the series provides a carefully designed program of instruction with the necessary time in-between for real-life application.

**Beginning GD&T - September 19-20**

Objectives: to build a solid foundation in GD&T concepts as the first step in learning to decode (not interpret) drawings, and as preparation for grasping the full spectrum of tools and rules, and ultimately learning to encode GD&T.

Skills: you will learn the fundamentals of machine part geometry management, including 3rd angle projection and coordinate system concepts, the Y14.5 symbol set, the concepts of and tools for controlling size, form, orientation and location, the Envelope Rule and the concept of Material Condition, BASIC dimensions, and Feature Control Frame encoding and decoding as they apply to design, manufacturing and inspection.

Who should attend? This course is recommended for everyone who deals with the design, manufacture, inspection and procurement of machine components and has had limited formal training in GD&T. It even recommended for well-trained individuals as an excellent foundation for our higher level classes.

**Intermediate GD&T - October 7-9**

Objectives: to deepen familiarity with the concepts, tools and rules of the Y14.5 standard in preparation for their rigorous application in analysing and encoding part function to specify manufacturing and inspection objectives.

Skills: you will gain advanced insights into the perfect world of coordinate systems, Datums, tolerance zones and BASIC dimensions, and the imperfect world of the real features they control. You will come to understand the weaknesses of classical tolerancing methods and the power of GD&T to deal realistically with reality. You will learn how to select and label Datum Features, how to configure Feature Control Frames to control the size, form, orientation and location of part features, and most importantly, how to construct Datum Reference Frames using the Smart GD&T tool and rule set. You will also learn the concept of the Virtual Condition and its power as a design tool, and you will do many exercises to hone your GD&T encoding and decoding skills.

Who should attend? This course is recommended for all who deal with the design, manufacture, inspection and procurement of machine components and wish to build true proficiency in the arts of en- and de-coding GD&T. It is essential as a foundation for our two advanced courses.

__More about your GD&T Seminar Leader__

Bill Tandler started his career with three years as a product R&D engineer with Hewlett Packard in Palo Alto, then spent five years as the European Sales and Marketing Manager for Coherent, Inc., only to found his own company, MultiMetrics, Inc. in 1975. His success in developing the Y14.5 based coordinate measuring machine software system GEOMET, and his hands-on involvement with CAD and various manufacturing processes during the intervening years, make him an unusually valuable resource in the field of GD&T. Bill's carefully organized approach to the subject, good sense of humor, and brilliant training models and manuals - the basis for Smart GD&T™ - make for a most effective learning experience.

For technical questions on Smart GD&T™ contact Bill via phone at 650-328-0200 or e-mail at multimetrics@batnet.com
Advanced GD&T for Design
November 6-8

Objectives: to introduce participants to the full spectrum of Y14.5 tools, and to refine their ability to assess and encode the function of machine parts, manage tolerance stack-ups among mating parts, and produce fault tolerant mechanical designs.

Skills: you will be introduced to the advanced concepts, tools and rules of the Y14.5 standard, including Composite Feature Control Frames, the Projection, Tangent Plane and Datum Feature - Material Condition modifier selection, and methods for controlling coplanarity, coaxiality and draft. The session is then given over to in-depth exercises illustrating how to encode, decode and re-encode drawings based on careful analysis of function and tolerance stack-up considerations. The entire third day of the course is devoted to a mock design review meeting, to which participants are encouraged to bring parts and drawings for in-depth analysis, fault tolerance maximization and rigorous GD&T encoding.

Who should attend? This course is recommended primarily for design engineers, but is useful for manufacturing and quality engineers to strengthen their ability to provide feedback to engineering.

Advanced GD&T for Mfg. & Metrology
December 9-11

Objectives: to reinforce the understanding of GD&T in general, and in particular to learn how to convert Y14.5 encoded drawings and CAD models into reliable manufacturing and inspection processes, with special emphasis on the use of the Coordinate Measuring Machine.

Skills: after a brief review of intermediate concepts, you will be introduced to the advanced concepts, tools and rules of the Y14.5 standard, including Composite Feature Control Frames, Projection, Tangent Plane and Free State modifiers, as well as the effects of Datum Feature - Material Condition modifiers, after which the session is given over to discussion of the implications of Y14.5 for manufacturing, followed by detailed explanations of the interface between GD&T and the software tools and processes involved in coordinate metrology, including in-depth exercises converting Y14.5 encoded drawings into CMM inspection processes. You will learn how to generate universal CMM programs and how to report on both product quality and manufacturing process quality. Participants are encouraged to bring parts and drawings for actual measurement with the classroom based coordinate measuring machine.

Who should attend? This course is recommended primarily for quality engineers, CMM programmers and inspectors, but is useful for design and manufacturing engineers to strengthen their ability to deal effectively with engineering feedback.

Design for X
September 26

Objectives: To teach structured methods which will help the attendees reduce costs and shorten the time-to-market of their products.

Skills: DFX methods, also referred to as Design for Six Sigma, or Life-cycle design methods, can help you develop better skills in:

- Identifying Markets & Customer Needs
- Creating a Customer-Focused Design
- Budgeting Design and Component Costs
- Developing Product Platforms
- Developing Easy to Assemble Products
- Developing and Selecting Innovative Concepts

- Creating Error-Free Designs, including Failure modes & effects analysis and Error proofing

Access to online training material will also be included.

Who should attend? Anyone who is involved in the product development process can benefit from this training. Design engineers, project managers, manufacturing engineers and technically-oriented marketing personnel will gain a better understanding of the product development process. This understanding enhances the creativity and decision-making processes of the team, and helps them flow the customer requirements down to the detailed technical specifications.

More about your Design for X Seminar Leader:

Dr. Mark Martin works with product development teams to improve their products and development processes. From TV’s, semiconductor chips, and power generating equipment in Japan to medical equipment, printers, and networking equipment in the U.S. he has taught and coached a wide range of teams on design for X methods. Dr. Martin’s industry experience, audits and tours of hundreds of manufacturing facilities, consulting and teaching, and Ph.D. in mechanical engineering from Stanford and masters in mechanical engineering and management from MIT have given him a unique set of design and manufacturing experiences which he brings to his instruction. His courses at Stanford and Santa Clara University all focused on teaching the same methods being taught in this course.

For technical questions on Design for X, contact Mark via phone at 650-248-7728 or e-mail at mark.martin@design4x.com
San José State University's College of Engineering presents

Product Design Management

Public Courses

Join us for our fully integrated course cycle on

GD&T & Design for X

- Beginning GD&T .................................................. September 19-20, 2002
- Design for X ....................................................... September 26, 2002
- Intermediate GD&T ............................................... October 7-9, 2002
- Advanced GD&T for Design .............................. November 6-8, 2002
- Advanced GD&T for Mfg. & Metrology .... December 3-5, 2002
Product Design Management
Public Courses

How to Register
Registration can be made using this form via fax (408.924.3995) or by mail:
San José State University
Dept. of Mechanical & Aerospace Engineering
One Washington Square
San Jose, CA 95192-0087
Attn: Professor B.J. Furman

You can find copies of this form and further information about the seminars at:
http://www.engr.sjsu.edu/bjfurman/GDTcourses/

Course Selection & Tuition
The Product Design Management seminar series consists of four courses on GD&T and one course on DFX (Design for X) product development methods.

Although no GD&T course is a prerequisite for any other, each one builds on the previous, making participation in the full cycle the most effective path. The DFX course is a stand-alone course.

Tuition includes course hand-outs, lunch, and morning and afternoon refreshments. Payments by check should be made to “MAE-PDP” and mailed to SJSU at the above address. Payment by credit card may be made via FAX or mail using this form. Registration is not complete until payment has been received. Registrations canceled later than 21 days prior to the first day of each course are subject to a 50% service charge. The balance will be refunded or may be applied to re-registrations.

When & Where
8:00 am – Registration & continental breakfast
8:30 am - 4:30 pm – Seminar
SJSU Engineering Building - Room 287. Consult the map at the course website for parking instructions.

Hotel Information
For local hotel and other information, please contact San Jose hotel information at: 1- 888-SAN-JOSE.

Questions?
Logistics: Professor Furman 408.924.3817
bjfurman@email.sjsu.edu
GD&T: Bill Tandler 650.328.0200
multimetrics@batnet.com
DFX: Mark Martin 650.248.7728
mark.martin@design4X.com

GD&T Series

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>Unit</th>
<th>Total</th>
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<tbody>
<tr>
<td>Beginning GD&amp;T (9/19-9/20)</td>
<td>$ 650</td>
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<tr>
<td>Intermediate GD&amp;T (10/7-10/9)</td>
<td>$ 950</td>
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<tr>
<td>Adv. GD&amp;T Metrology (12/3-12/5)</td>
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<tr>
<td>Advanced GD&amp;T (11/6-11/8)</td>
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<tr>
<td>All four GD&amp;T courses</td>
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<tr>
<td>Little Encyclopedia of GD&amp;T</td>
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Design for X

| Design for X (9/26) | $ 350 | _____ |

Sub-Total: _____

Discounts

| Same company, simultaneous sign-up discount (3 – 5, 10%; 6 & up, 15%) | (_____)
| Total: | _____ |

My check is [ ] enclosed, [ ] being sent by mail.
My [ ] Visa, [ ] MasterCard, [ ] American Express, credit card number is:

Expiration . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Authorized Signature:

Interested in future courses or on-site seminars? Call or email us and we can give you more information.
The Little Encyclopedia™ of GD&T
The ultimate daily resource for applying the ASME Y14.5M 1994 standard

Special SJ SU Course Offer!
See order form on the back!

The Book
The Little Encyclopedia™ of GD&T is a highly organized technical resource for Design, Manufacturing and Inspection professionals interested in finally eliminating the fog and getting it right with GD&T. The Little Encyclopedia™'s 102 pages in 8.5" x 11" format contain a substantial illustrated glossary which describes all its tools and rules, its strengths and weaknesses, as well as what to do in certain situations and what not to do. With paragraph and page references to the Y14.5 standard throughout, it also contains detailed sections on tolerance zone visualization, the effects of Material Condition modifiers, and insights into Datum Reference Frame definition and construction. A treasure trove of crystal clear explanations and crystal clear illustrations, the Little Encyclopedia™ is the result of 20 years of experience, and 8 years of planning and field testing, now in its eighth printing.

Datums and Datum Reference Frames

Feature Control Frame Decoding

Definitions
BASIC Dimensions: theoretically perfect angular and linear dimensions which specify the orientation and location of tolerance zones and Datum Targets.

Datum Features: specially designated, physical surfaces of an object, which serve to reduce its degrees of rotational and translational freedom.

Material Condition Modifiers: encircled letters M and L used in Feature Control Frames, which, when following a tolerance, authorize a bonus in the form of an expanded tolerance zone, and when following a Datum Feature Label, authorize a bonus in the form of tolerance zone mobility.

Tolerance Zone: a bounded region of space within which a particular component (axis, linear surface element, etc.) of a feature is required to lie.

Tolerance: the size of a tolerance zone.