

UTS Teaches Plastic Gear Design & Manufacture



Plastic is different than metal. This obvious fact means plastic gears are different than metal gears. Yet there are gear engineers who don't learn the differences before sitting down at their workstations, starting their solid model programs and attempting to design plastic gears like they were metal ones.

Not surprisingly, the projects become problems.

"As consultants, we see a lot of those," says Philip Cooper, sales manager for Universal Technical Systems Inc. Located in Rockford, IL, UTS offers software and consulting services for plastic and metal gears.

It also offers a three-day course, "Plastic Gear Design & Manufacturing" to gear engineers who need to understand the different parameters used with plastic gears.

The class is concerned with solving practical problems involving plastic gears, such as high tooling and manufacturing costs, inadequate load carrying capacity, heat generation, performance variations (lot to lot), premature gear failure, and excessive noise.

The course covers the basics of plastic gearing, such as involute gear theory, important gear geometry factors, optimization of gear sets, mold design, materials characteristics, quality control and design methods for plastic spur, helical, crossed-axis, epicyclic and face gears.

It also covers minimum weight design strategies, gear size (including radial and axial shrinkage), geometry design, rating, producibility analysis, torsional analysis, lubrication, and profile analysis.

Students learn about a number of other advanced topics: robust design methods, application of non-standard proportions, accounting for extreme operating conditions, minimizing operational variation, predicting tooth deflection at mesh temperature, and applying proper tip relief.

They also learn about inspection and quality control issues. This includes a tour of Forest City Gear, a fine- to medium-pitch gear shop in nearby Roscoe, IL. Forest City makes plastic gears in low to moderate volumes. Moreover, as Cooper explains, Forest City has excellent analytical inspection facilities, and a number of companies send their plastic gears to it for inspection.

The course is taught by Jim Marsch, UTS' gear software product manager. Marsch has 35 years of experience in powertrain manufacturing, including 12 years at Allis-Chalmers, where he designed agricultural tractor powertrains, and 22 years at Harnischfeger Corp., where he designed powertrains for cranes.

Marsch's experience with plastic gears comes from his time with UTS, with consulting projects involving Xerox, Hewlett-Packard, Whirlpool, Maytag and other companies.

During the course, each student can discuss his particular gear problem with Marsch in one-on-one time on the class's last day or during previous evenings if necessary. Attendees interested in having one-on-one time should bring their prints and design problems.

The next class will be held Nov. 8-11 at the UTS operation in Rockford. The course is limited to 15 students, who share eight workstations. As long as space is available, people can register for the course as late as Nov. 1. The class costs \$1,250 per person.

Besides lectures, the course offers hands-on exercises, including gear design problems for completing in class. The exercises are performed using Integrated Gear Software, UTS' suite of gear design software. Also, course discussion sometimes covers some point involving the use of TK Solver, the math modeling and programming application that is the calculation engine for Integrated Gear Software.

Consequently, UTS recommends students take its one-day TK Solver training course, given Nov. 7, the day before the plastic gears course starts. The class costs \$295 per person.

The course covers various aspects of TK Solver, including solving equations, creating tables and plots, converting units, using built-in and user-defined functions, generating reports, and using TK Solver's library.

Students must reserve hotel rooms themselves, but UTS recommends these three hotels: Quality Suites of Rockford, Clock Tower Resort, and Candlewood Suites. Attendees making reservations at Candlewood can obtain a special room rate by mentioning UTS training.

Other details are available on the UTS website via a downloadable information packet.

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Measurement Training Comes To Your Facility

Whether you're involved in gear cutting, setup, engineering, management, metrology or quality control, keeping up with the changes in the world of standards is becoming more time-consuming every year. Gleason-M&M Precision hopes to demystify the pages of documentation from AGMA and ISO with its "Gear Measurement Course." The course, held periodically at the Gleason-M&M facility in Dayton, OH, is now being offered at customer locations as well. Usually, this option is more economical for companies with at least 3-4 participants.



Ed Lawson

Ed Lawson, director of metrology at Gleason-M&M, teaches most of the course. Lawson led the A2LA accreditation efforts for the company's gear lab. As chair of AGMA and ISO committees developing current generation gear accuracy and calibration standards, he developed the course after perceiving an industry-wide need for more detailed information.

"For decades, ISO and AGMA standards have been static. Then completely new documents have been written in the last few years. We're in a state of change at the moment, and everyone can stand to get up-to-speed," he says.

In addition to standards, course topics include:

- Gear Metrology: Terminology, Theory and Practice;
- Gear Accuracy Standards;
- Calibration & Uncertainty;
- Analysis of Involute & Helix Tests;
- Spline Metrology; and
- Gear Math.

Attendees take home a set of PowerPoint handouts, with the text conveying the primary message of a given slide. Lawson hopes the handouts become a book-like reference for the participants.

Content within these handouts varies according to the level of professional experience. The gear measurement course is designed in modules so that advanced topics can be presented to those directly involved with their gear labs. On the other hand, a two-hour executive overview format is popular with management personnel who don't have a need for the more detailed information.

Gleason-M&M tries to keep attendance at about 12 participants to encourage discussion. For companies who have larger numbers of employees interested in gear measurement, Gleason-M&M now offers off-site training at the customer's facility.

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A session of the course is being held at Gleason-M&M on Sept. 19–21. Price per person is \$495 per class. If all three classes are taken at the same time, the cost is \$1,465 per person. Customized training at Gleason-M&M is \$4,895 per class, on site customer training is \$6,400 per class. For information about the next session or to inquire about having the course presented at your location, contact Gleason-M&M directly.

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Gears2005

Focuses On Applications

The British Mechanical Power Transmission Association has sponsored gear seminars in the past, but Gears2005 Technical Awareness Seminar, slated for Nov. 17–18 at the Manchester Airport Moat House, promises to be more application-focused than in past years.

Dr. Harold Wright, technical secretariat for the event, recommended splitting the seminar into sessions specific to different industries. Specific focuses include transport (road, rail, and sea), automotive, design technology, process industries, environment and iron & steel production.

“We decided to move in a more application-oriented direction to make life exciting. We want people to leave saying, ‘Wow, I didn’t know I could sell to the Ministry of Defense.’”

The target audience of about 80 should consist of equipment users, sellers, manufacturers consultants and academics.

Day one is devoted to sessions on transport, design technology and process industries. The first session is chaired by Commander Tim Roberts of the Royal Navy, head of the

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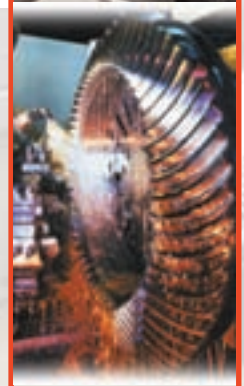
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British Ministry of Defense Transmissions Group, and will cover developments in the leisure industry, public transport and military applications.

Each session includes a 20-minute PowerPoint presentation followed by discussion. The second session includes a presentation by Martin Halley, chief engineer for Xtrac Ltd., on the state of the automotive industry. BMW and other car designers and manufacturers will outline current trends in gearbox/drive conception and their applications to car performance.

The design technology session is chaired by Professor Tom Hyde, Hives professor of mechanical engineering and head of the school of mechanical, materials and manufacturing engineering at the University of Nottingham. New material development and post-millennium gear cutting tools will be discussed.

The final session of the first day analyzes process industries, recent legislation, modern bearing design and water treatment business opportunities and will be headed by Dr. Nigel Mainwaring, technical director at Russell Finex Ltd.

Day two includes focuses on the environment via sub-sea and wind turbines and is chaired by Bob Turner, supply chain manager at WindSupply. In-depth views on plant and equipment drive, transmission and lubrication needs will be presented in the iron & steel productoin session by Kevin Peacock, manager of engineering technology at Corus Northern Engineering Services.

The BMPTA offers six payment structures for attending Gears2005. The cost to attend all five sessions plus a dinner and overnight accommodations at the Manchester Airport Moat House in Manchester, U.K., is £360. For updated price information, visit the seminar's Internet site at www.gears2005.org.uk.

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October 10–13—Gear School 2005. Gleason Cutting Tools, Loves Park, IL. This course blends shop time and classroom study. Course content includes gear fundamentals, high speed steels and coatings, gear cutting and inspection. Participants tour the Gleason Cutting Tools plant and an offsite tour of a complete manufacturing facility is offered. \$895. For more information, contact Gleason Cutting Tools by telephone at (815) 877-8900 or via the Internet at www.gleason.com.

October 25–27—Design2Part Show. Pheasant Run MegaCenter, St. Charles, IL. The largest contract manufacturing trade show includes exhibitors in the following categories: Machining, Cutting, Grinding, Finishing, Electronics, Assemblies, Components, Forming, Castings, Rubber, Plastics, Composites, Design, Prototyping, Testing, Fabrication, Tools, Dies, Molds, Patterns, and Fixtures. Registration is free, and the deadline is Oct. 18. For more information, contact Job Shop Shows on the Internet at www.Design2PartShow.com.

November 1–3—Mastering Shot Peening & Blast Cleaning. Renaissance Worthington Hotel, Dallas/Fort Worth, TX. Focuses on proper shot peening procedures, products and plotting a saturation curve, establishing machine parameters to ensure correct stress profiles and fatigue life, audit proceedings, prevention of machine malfunctions and more. \$850 for one attendee, \$750 each for two to three attendees, and \$650 each for four or more attendees. For more information, contact *The Shot Peener* magazine by telephone at (800) 832-5656 or on the Internet at www.shotpeener.com.

November 5–11—ASME International Mechanical Engineering Congress and Expo. Walt Disney World Swan & Dolphin Hotel, Orlando, FL. Technical program includes engineering research presentations broken down into 600 sessions covering nearly 50 fields. Keynote speaker is Col. Mike Mullane, NASA shuttle astronaut and novelist who was recently inducted into the International Space Hall of Fame. Registration is accepted through Nov. 4 and ranges from \$25–\$700, depending on how much of the program a person registers for. One-day attendance ranges from \$425–\$625. For more information, visit ASME's website at www.asmeconferences.org.

November 13–16—FABTECH International & AWS Welding Show. McCormick Place, Chicago, IL. Designed for metal forming and fabricating personnel involved in cutting, lasers, fabrication/forming, stamping, tubes and pipes. For SME/FMA/AWS members, prices range from \$160–\$565, depending on the number of technical sessions attended. Non-member costs range from \$180–\$665. Registration is increased \$25 after Oct. 21. For more information, contact the Society of Manufacturing Engineers on the Internet at www.sme.org/fabtech or call (800) 733-4763.

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