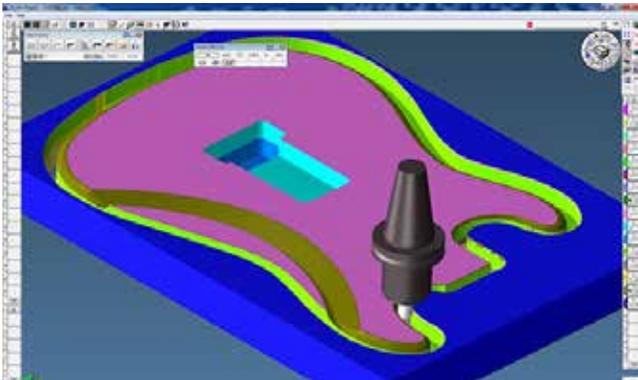




In addition to manual machines, the shop has 14 CNC machines, mostly industrial Haas and Fadal machines, from 2-axis lathes to 4- and 5-axis machining centers.

Enticing Students to Manufacturing

Cerritos College Makes Music



Cerritos College (Norwalk, CA), founded as a two-year college in 1955, began accommodating those who wished to enter manufacturing and the metalworking trades in 1961, with construction of the Metal Trades Shop Building. Like the rest of the Cerritos College campus, the building has undergone considerable modernization, incorporating the latest technology to align learning tools with the modern working tools of industry. It is within this building that the machine tool technology (MTT) program is taught. Classrooms are filled with net-worked computers for teaching CAD/CAM and other computer-based applications, while nearly all of the shop's machine tools are now CNCs.

The MTT core curriculum – completion of which earns the student a certificate of achievement - is designed

The GibbsCAM educational version is identical to the industrial, so that students employed by industry see no difference from their learning platform, with the same functions, capabilities and features, such as Cut Part Rendering, the GibbsCAM toolpath verification feature, which enabled students to test the toolpath programmed for a K2CNC 3-axis router.

to provide students with the practical, working knowledge required for careers in manufacturing. Students who also complete the general education requirements earn an associates degree which enables them to transfer to a four-year college to pursue a bachelor's degree

MTT studies include machine tool concepts, shop math, blueprint reading, inspection, fixture tooling, manual machining and set up, NC programming, CNC machining and set up, and robotics. Classrooms used for CAM and NC programming instruction are wired on a high-speed network to accommodate up to 24 students, one computer per student. Among the softwares used for MTT instruction are GibbsCAM for NC programming, and Verisurf for computer assisted inspection. GibbsCAM has solid modeling capability, as well as all the functionality required for the efficient programming of lathes, turning centers, mills, machining centers, wire EDM, plus mill-turn and multi-tasking machines. Verisurf drives inspection arms, such as the FaroArm, to measure parts. The shop has 14 CNC machines, mostly industrial Haas and Fadal machines, from 2-axis lathes to 4- and 5-axis machining centers, plus manual machines.

The core curriculum of the MTT program is taught by six instructors, five of them teaching part time and still working in industry. Nick Real, Cerritos' dean of technology, was the full time instructor up to 2011. After earning degrees in mechanical engineering and industrial engineering, he worked at a local company for ten years, before becoming the MTT department chair. In that role for eleven years, he also taught machining, before becoming dean of technology to face different challenges.

Mr. Real explains that interest in the MTT program within local industry is healthy. "We don't have to reach out to industry to fill our evening classes," he says. "We always have to turn away students because there are too many for the number and size of our classes." The majority of these students, he explains, are people who already work in manufacturing, and are taking courses to qualify for a raise, or people outside of manufacturing within a manufacturing company who have seen that manufacturing salaries are much higher than their own salaries. Although MTT classes are always full, each year only 15 people graduate with a certificate of achievement and two people with associates degrees. "A lot of the students in the certificate program only come for a few courses, get a job, and don't finish the program," he adds. "The regular students don't see value in the general education required for the associates degree, and prefer classes



Michelle Carrillo, one of the high school students enticed to learn about manufacturing in the Cerritos College MTT program, monitors and waits for the CNC router to finish machining a guitar body. (PC with K2CNC software serves as the router's control.)

that teach new skills – plastics, welding, product development, or engineering design technology – as those classes are more likely to get them a raise. The associates degrees are typically earned by working people who have bachelor's degrees, but who come to learn machining because their current jobs don't pay as much." In contrast to students from industry, getting high school students interested in manufacturing has been a challenge, in large part because high school students have no concept of manufacturing, and are not interested in making things. "It's difficult to tear them away from their cell phones and social circles," says Mr. Real. "We needed a way, a program, to bring them in." The MTT department quickly discovered that such a program was already available from Canadian GibbsCAM Reseller, CAM Solutions, as part of the training curriculum they provide to colleges and technical schools through their GibbsCAM College division in Ontario, Canada. The "course material" is a kit to make, finish, and assemble a working electric



Alexis Estrada (left) sands the front side of his guitar body in preparation for set-up to machine the back, while Adam Mitchell, having machined both sides of his, smooths the step left by machining the second side.

guitar. The kit includes a preassembled guitar neck, all the necessary hardware and electronic components to make a working guitar, a block of basswood to create the guitar body, plus an instruction book that guides the student through the modeling, NC programming and machining of the body, with illustrations showing the GibbsCAM screen at each stage, and instructions on finishing and assembling the guitar.

MTT instructors decided that the guitar kit would be an ideal project to introduce students to manufacturing. To enable participation without fees, the department obtained full funding through grants and the California College Pathways program. Funding enabled adding two K2CNC 3-axis routers, the machines recommended by GibbsCAM College. Mr. Real explains that, for spatial and other considerations, the machines could not be placed in the metal shop. “Fortunately, we have a really good woodworking department on the Cerritos College campus, so we put the machines there,” he adds. “They have one large router, but it’s used for just one class, so we also saw this as a way to introduce and sort of democratize CNC technology within woodworking, so students could see the value of making smaller parts or custom parts, maybe get of making smaller parts or custom parts, maybe get them excited about CNC.”

Brochures mailed to area high schools, describing the course and free guitar, generated sufficient interest to fill a class of 20 students. With sessions each Saturday, the class ran for 18 weeks (roughly 72 hours), finishing in a single semester. “That’s very quick for students who know nothing about manufacturing, tools, CNC machines, CAD or CAM,” says Mr. Real. “It’s exceptional. If it wasn’t for the great instructor and the support personnel assisting him, it could not have happened. Very few instructors could do that in 72 hours.”

The instructor, Mario Guerrero, says that much of the credit goes to the software and to the students. He teaches various classes with GibbsCAM, including CNC programming and set up, operations in CNC, plus GibbsCAM Lathe, Mill, and Advanced (multi-axis). “Although the GibbsCAM educational version is identical to the industrial version, it is easy to use, very intuitive, and fun for students,” he says. “The kids really took to the class. They are computer literate. Their minds were like a sponge, and they were very excited about things that were new to them. Many were better than some of my adult students.”

Mr. Real adds that “The course was a complete success, because the students were introduced to manufacturing, learned a little about product development, manufacturing processes, CNC machining, finishing



High school student, Mario Everhart, displays the guitar he machined, finished and assembled in the introductory machine tool technology course, while learning various aspects of manufacturing.

and assembly, and walked away with a working electric guitar that they machined, sanded and painted. We hope the interest stays with them and that they will talk about and remember the process and satisfaction of making things and not just about having a new guitar.”

Program success, as demonstrated by student interest and enthusiasm, led to fully funding another semester. So, this fall another 20 students will get a free introduction to manufacturing, with guitar, after which the class will be offered for a fee. Meanwhile, Cerritos’ MTT department is seeking grants to incorporate additive manufacturing in its curriculum, which is sure to draw additional interest in making things.



Nick Real, dean of technology at Cerritos, says this Haas 5-axis machining center, a recent addition to the metal shop, extends MTT instruction from virtual 5-axis programming and simulation to real 5-axis machining.



Ease of Use

GibbsCAM's graphical user interface is easy to learn and use, getting you up and running in no time.



Breadth of Capability

Programming capabilities support solid modeling, 2-5 axis milling, high-speed machining, turning, mill/turn, multi-task machining, Swiss, tombstone and wire-EDM



Manufacturing CAD

GibbsCAM provides integrated CAD functionality for geometry, wireframe, surface, and solid model creation and modification necessary to support the special needs of manufacturing. Use it to program from blueprint, design fixtures and molds or repair the imported data.



3D Simulation

GibbsCAM can display a full machine showing the complete manufacturing process, eliminating any collisions and programming errors long before the part makes it to the shop floor.

GibbsCAM CNC Programming Solutions

For over thirty years, Gibbs and Associates has been a leader in providing cutting edge CAM technology, while maintaining its signature ease-of-use and productivity. No matter where your CAD files come from, GibbsCAM provides tools that are naturally intuitive, graphically interactive, fully associative, and just plain enjoyable to use. GibbsCAM is a total quality solution with the service and support successful customers need.

GibbsCAM Capabilities and Benefits

- » **Intuitive graphical user interface** that is easy to use
- » **Short learning curve** makes the GibbsCAM system easy to learn and remember
- » **Integrated manufacturing CAD capabilities** provide accurate geometry creation and modification
- » **Full associativity** automatically allows processes to be quickly and easily updated
- » **Interactive Feature Recognition** provides an easy-to-use way to identify feature geometry for machining
- » **Automated Feature Recognition** automatically identifies hole features and their corresponding parameters
- » **Hole Manager** capability organizes and simplifies the programming process for holes
- » **Hole Wizard** capability simplifies compound hole creation
- » **Powerful macro programming** capability allows users to create their own extensions to the system, maximizing productivity
- » **Knowledge-based machining** stores your company's manufacturing expertise for reuse
- » **Advanced toolpath generation** creates fast and accurate gouge-free machining
- » **3D Cut Part Rendering** reveals any errors before material and machine time are wasted
- » **Reporter function** easily generates comprehensive process documentation for the shop floor
- » **Machine Simulation** allows programs to be checked for potential part, tool and machine interferences
- » **Over 11,000 error-free post processors** ensure what-you-see-is-what-you-machine output, with over 1,250 posts for multi-task machines (MTM), including Swiss machines
- » **Directly transfer models files and assemblies** from within Autodesk® Inventor®, CimatronE, KeyCreator®, Rhinoceros®, Solid Edge, and SolidWorks® into GibbsCAM for machining
- » **Exchange data with CAD systems** using ACIS®-SAT®, DXF, DWG, IGES, STEP AP203/AP214, VDA-FS, Parasolid, CATIA® V4/V5, STL, Siemens NX and PTC® Creo Parametric formats and all of the files from the systems mentioned above.

CAD System Certification

GibbsCAM is certified under the Autodesk Inventor Certified Applications Program, is a PTC GRANITE Partner, is a Gold Tier Partner within the PTC PartnerAdvantage Program, is a Siemens Solution Partner Program-PLM for Solid Edge Product and is a SolidWorks Certified CAM Partner Product.



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