Nowhere to Go but **Up**

A student uses simulation to reach new heights in secondary school education.

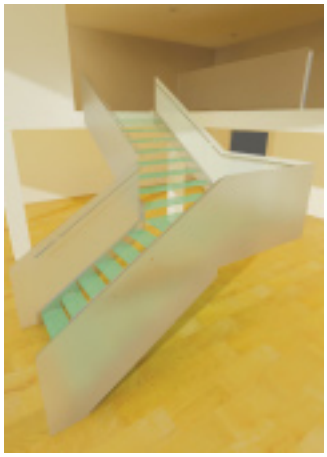
By Shane Moeykens, ANSYS, Inc.

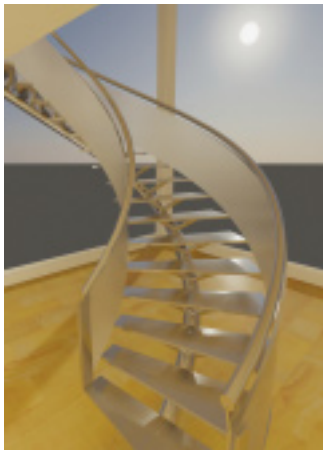
The Battle Creek Area Mathematics and Science Center (BCAMSC) is one of 33 regional centers in the Michigan Mathematics and Science Centers Network. Secondary school students attend these centers half of each school day for mathematics, science and computer education, and spend the remainder of the day at their home school for other course work. By the end of the four-year specialized program, every student will conduct at least one formal research project, and most students will engage in multiple research endeavors. Various courses are structured to accommodate a successful and unique research experience using problem-based inquiry so that each student can answer a question of interest.

In his advanced physics class, Scott Taylor, a BCAMSC student with interest in architecture and structural engineering, decided to investigate floating staircase designs. "The primary focus of the investigation was to determine if the staircases would function," commented Taylor. "To answer this question, virtual prototyping seemed the obvious choice, recognizing that stress solutions allow you to predict safety factors, stresses, strains and displacement. My goals were to better understand design limits for staircases and to develop a working knowledge of a commercial FEA package."

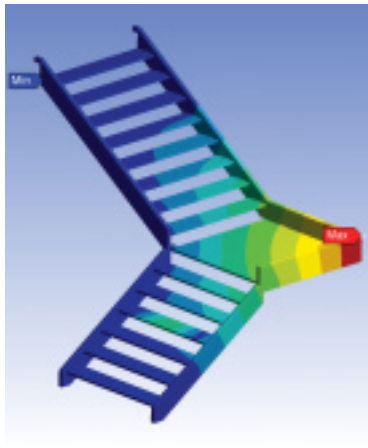
Taylor turned to ANSYS DesignSpace software (a feature of the ANSYS Academic Teaching Introductory product) to conduct this analysis, upon the suggestion from BCAMSC faculty. Two different designs were considered: an angled staircase and a curved staircase. The 3-D geometry models for each staircase were created using AutoCAD®. To simulate the effect of human loading, separate models were created in which a 60,000 pascal load, the equivalent of four to five people standing on a stair, was applied to individual steps along the length of the staircase. Deformation results from these human load cases were then calculated.

The Global Academic Program at ANSYS is a key enabler for schools such as BCAMSC to introduce students to engineering analysis tools. Karen Payson, Taylor's instructor in the advanced physics class at BCAMSC, commented, "It's great to see talented kids like Scott get excited about design by giving them the opportunity to gain a sense of how finite element packages work through hands-on application of the same analysis tools used by practicing engineers in the field. The obvious benefit of the ANSYS DesignSpace tool is that it allows students to answer their own questions via problem-based inquiry." Paul Lethbridge, Global Academic Program Manager for ANSYS, Inc., added, "The intuitive ANSYS DesignSpace product is a powerful enabler for exposing secondary education students to CAE tools. Analysis tools continue to permeate a much broader community than the core analysts, who were using this type of technology not all that long ago, largely driven by improvements in graphical user interfaces, workflow and CAD geometry interfaces." ■





As part of a high school research project, Scott Taylor analyzed loading variations for two staircase configurations: angled (above) and curved (below).



FEA results of staircase analysis