Contemporary architectural designs often exhibit complex curvilinear form and morphology instead of being rectilinear, while material finishes frequently have complex spatially varying properties rather than merely being a single solid color. This course will focus on the computer graphics tools that are helping to make these paradigm shifts in architectural design possible, and it will explore how these software programs, individually or in combination, can lead to further changes in how architectural design is pursued. The course will include lectures that describe the historic lineage of new algorithms and programs that have been created to facilitate the architectural design process. Presentations will also be given on the work of contemporary architects who are making aggressive use of these new computer graphic tools in the design of their buildings. Students will read and discuss papers from both the computer science and architectural design fields in which these computer graphic techniques and their application to architectural design are described.

The assignments in the course (there will be no exams) will be done by teams composed of both architecture and computer science students. Some of the projects will involve the use of state of the art commercial programs that are employed in design practice but are not commonly interrogated critically in architecture design courses. Other assignments will utilize computer graphic research software that is not yet available for use in design practice. In most of the assignments the computer science students will either develop plugins for commercial software or extensions to the research software, and the architecture students will apply the software to the pursuit of design related questions and propositions. In this way computer science students will be given guidance on how to make useful practical modifications to the software and architecture students will be able to make more effective use of the computer graphic architectural tools. Here are some examples of the types of assignments that may be done (see reverse side):
• **the use of photogrammetry to model buildings** - Acquiring the shape and form of an existing building is commonly done today using photogrammetric techniques. Students will work with existing commercial software, such as Agisoft PhotoScan, to acquire the representation of a building. Collaboration with an outside firm (like CAD Technology Center) that specializes in the photogrammetry of buildings may be possible.

• **employing curved surface software in the design of buildings** - Some of the most innovative architectural designs being created today make heavy use of curved surface modeling and generative algorithms. An example of such a commercial software suite is Rhino combined with Grasshopper. Grasshopper is a scripting tool that can be used in combination with Rhino to produce structures such as the one shown below.

• **selecting the materials and finishes for a building** - The ability of computer graphic software to accurately model the color and appearance of materials has improved dramatically, and photographic techniques are being explored for use in the acquisition of material appearance. The use of image based rendering software developed for this purpose at the UM will be explored in this assignment.

• **capstone design project** - In a final project for the course, students will explore how the tools that they have learned about during the rest of the class can be employed in the production of an actual architectural design. The goal will be to demonstrate how the tools allow new approaches to be taken in the design process. Students will be given the same design brief, they will pick one of the technologies to emphasize, and they will work in interdisciplinary teams (including both architects and computer scientists) to come up with a solution that demonstrates the effectiveness of their chosen tool.

The class will be open for enrollment by both computer science and architecture students, and it will be co-taught by a faculty member from the computer science department who specializes in the development of computer graphic algorithms and a faculty member from the architecture department who specializes in the application of computer graphics to architectural design. For computer science students, exposure to computer graphics (CS 4611 or CS 5607) would be helpful but not essential.