Syllabus

CPSC 679 Computational Issues in 3-D Design and Fabrication
SPRING 2016

This course focuses on computational methods for designing and fabricating 3-D objects. The course considers the data structures and algorithms for the complete process, from specifying physical source material to the production of a new physical object. The process begins with obtaining the shapes of existing 3-D objects in digital form using active 3-D scanning or photogrammetry. The digital shape is then edited with a variety of local operators and global filters. The shape description is then prepared for input to a numerically controlled machine. Production by various means is considered, including fused deposition modeling (FDM), milling, and laser cutting.

Class Meetings: M/W 4:00-5:15 pm

Instructor: Prof. Holly Rushmeier, AKW 207, holly.rushmeier@yale.edu
Office hours will be announced on a week-to-week basis, or you can email for an appointment.

We will use Piazza for questions/answers/comments outside of class hours.
https://piazza.com/yale/spring2016/cpsc679/home

Course Web Pages: http://classesv2.yale.edu/

Texts:
We will be using freely available materials from the Internet, and technical papers available from the ACM and IEEE digital libraries via Yale's subscription. (Unlike Yale's subscription to Safari books, ACM and IEEE papers can be downloaded, and there is no limit on the number of simultaneous users)

Lectures: Lectures will be given as a combination of projected PowerPoint slides and examples written on the blackboard. Pdf versions of the PowerPoint slides will be posted. If you have to miss a lecture, be sure to get the notes from another student since the posted pdf files may not contain all of the information presented. After the first few weeks, a substantial portion of the lectures will be student presentations of recent technical papers.

Since this is a class in the Graduate School, instruction is formally scheduled to extend to May 5. Prof. Rushmeier will be away on April 18th, 20th and May 4th. Substitution for one of these sessions will be attendance at equipment training sessions for the use of scanners and printers. Substitution for another will be mandatory attendance at the February 11th seminar by Stefanie Mueller (there will be an alternative video viewing and discussion of Muellers' work scheduled for those with a conflict on Feb 11th). Substitution for the other session will be a one-on-one project review to be scheduled for May 2,3, 9 or 10.

Course prerequisites: Graduate standing in computer science is required. Graduate students from other disciplines must have completed computer science courses beyond introductory programming. For Yale undergraduates who want to take the course for credit, completion of CPSC 223 is required, and completion of CPSC 323 is recommended.

Course requirements: The workload for this course consists of 5 homework assignments, one written midterm exam, class presentations and a final project. There is no comprehensive final exam.

The homework assignments will each consist of written problems, short programs, and end-to-end design and fabrication of physical objects.

The single written midterm will cover the fundamentals presented in the first half of the term.

Students will be required to present and discuss recent technical papers in the second half of the term.

The final project will require defining a new class of physical object that meets a specific functional challenge, such as being capable of a particular type of motion, having particular mechanical properties, encoding information or having particular optical properties. The design of the new object will require using 3D scanned data and new custom code as well as the use of existing tools. A physical object must be produced from the design, using computational techniques studied in class.

Grading:
Homework Assignments: 30 %
Class Presentations/Participation: 25 %
Exam: 20 %
Final Project: 25 %

Auditors: Students not taking the course for credit are welcome to sit in on lectures and discussions. However, only students registered for credit will have access to the scanners and printers reserved for the class. Students not registered for credit should consider joining the Yale CEID (http://ceid.yale.edu/member/#membership) and using those facilities.

Policy on Working Together: Unless otherwise specified, the homework assignments and project are your individual responsibility. Plagiarism is a violation of University rules and will not be tolerated. You must neither copy work from others nor allow your own work to be copied.

You are encouraged to ask others for help with the computers, equipment, programming languages, APIs, and general questions about the concepts in the course. Make use of Piazza when you find possible mistakes or ambiguities in the statement of homework problems or bugs in the tools we are using in the course. Working in groups to solve homework problems is not permitted in this course. Please talk to the instructor if you have any questions about this policy.

Late assignments: It is important that assignments be completed on time. Late assignments will be accepted from graduate students if you make arrangements ahead of the due date, or in the case of illness. Late assignments will be accepted from undergraduates only with a Dean's excuse.

If you are not completely finished by the due date, turn in as much as you have been able to get done. Depending on the circumstances late assignments, other than the final project, may be accepted for substantially reduced credit if a solution has not been discussed in class. "Substantially reduced credit" means your score will be 50 per cent or less than what it would have been had the assignment been turned in on time.

If you believe you are in danger of failing, it is your responsibility to discuss the problem with the instructor and your academic advisor (or Dean in the case of undergraduates) before the end of the course.