

CSE 598C – Meshing Techniques

Fall 2011

Course Description

Unstructured and structured mesh generation methods (including Delaunay, advancing front, quadtree/octree, and other methods); mesh quality improvement methods; mesh morphing; adaptive mesh refinement; mesh compression; connection to PDEs, solvers, and applications; parallel mesh techniques.

Course Meetings

Tuesdays and Thursdays, 4:15 – 5:30 PM
333 IST Building

Instructor

Dr. Suzanne M. Shontz
343J IST Building
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Office Hours: 3-4 Tuesdays or by appointment.

Teaching Assistant

No teaching assistant.

Optional Text

Geometry and Topology for Mesh Generation
by Herbert Edelsbrunner
Cambridge University Press
Published April 2006

Prerequisites

One of CMPSC/MATH 451, 455, 456 or an equivalent course from another department or instructor approval.

Course Requirements

Lecture attendance is required, although attendance will not be recorded. The course requirements for CSE 598C include successful completion of several homework assignments and a final project.

Homework assignments will include reading research papers and other such handouts, one class presentation (on a subset of the above readings) by each student, short exercises, and one project-based assignment. The project-based assignment will include mathematical and programming aspects. There will also be a final project which will consist of three parts: (1) the project itself, (2) a project report, and (3) a project presentation. Each student will choose his/her own topic for the final project.

Course Requirements (continued)

Programming for the assignments and the project may be done in a scientific programming language of your choice (such as C, C++, Fortran, or Matlab) *with the caveat that I must be able to read, understand, and execute your code.* **Thus, if you are considering implementing your code in a language other than those listed above, you must get approval from me before doing so.**

Homework will be due at the beginning of class. Due dates for each assignment will be announced in class. **There will be a late penalty of 15% per day for homework handed in late.** No homework will be accepted more than 7 days late. **Presentations on readings must occur on the dates that they are scheduled.** The final project will constitute a large project on which you will spend 1-2 months; I will be more precise about this in class. **The final project, project report, and project presentation may not be submitted late since they will be due at the end of the semester.**

Grading

Class participation will count for 10% of the final grade. Homework assignments will count for 40% of the final grade. The project will count for 50% of the final grade.

Class Schedule

The course schedule indicates a basic plan for the course. The topics and length of time on each topic are subject to change by the instructor. Any significant changes will be announced in class.

Course Website

There is a course website within ANGEL accessible via <http://cms.psu.edu>.

Books on Reserve

I am placing the following books on reserve for this course at the Physical and Mathematical Sciences Library: (1) Geometry and Topology for Mesh Generation by Herbert Edelsbrunner; (2) Computational Grids: Generation, Adaptation, and Solution Strategies by Graham Carey; (3) Fundamentals of Grid Generation by Patrick Knupp.

Academic Integrity

Students are allowed to collaborate on the homework assignments to the extent of formulating ideas with one or two others in the class. Each student is expected to write up the homework assignment by himself or herself. Students must not hand in an assignment that represents somebody else's ideas entirely. Students should do the programming by themselves--no program code should be shared.

Students are permitted to consult outside published material for the homework, although the homework will be fully based on lecture notes, the textbook, and the readings. If a student consults a source other than the lecture notes, the textbook, or the readings, he or she must cite the source--failure to cite the source will be considered cheating.

The final project will be unique for each student and thus must be the result of individual efforts. Any literature references used must be cited--failure to cite the source will be considered cheating.

The penalty for cheating will range from an F for the assignment to an F for the course, depending on the severity of the offense, following a hearing with the instructor as spelled out in the university's academic integrity policy. In extreme circumstances the instructor will in addition bring the case before the university's Academic Integrity Committee and/or the Office of Judicial Affairs.

Suzanne M. Shontz, Pennsylvania State University, shontz@cse.psu.edu

Course Calendar

This schedule is subject to change.

Week	Dates	Topic
1	8/23/11, 8/25/11	Connection of Meshes to PDEs
2	8/30/11, 9/1/11	Applications of Meshing
3	9/6/11, 9/8/11	Delaunay Mesh Generation Techniques
4	9/13/11, 9/15/11	Delaunay Mesh Generation Techniques
5	9/20/11, 9/22/11	Advancing Front Methods
6	9/27/11, 9/29/11	Quadtree/Octree Methods
7	10/4/11, 10/6/11	Other Mesh Generation Methods
8	10/11/11, 10/13/11	Mesh Quality Improvement Methods
9	10/18/11, 10/20/11	Mesh Quality Improvement Methods
10	10/25/11, 10/27/11	Connections Between Meshing and Solvers
11	11/1/11, 11/3/11	Mesh Morphing
12	11/8/11, 11/10/11	Adaptive Mesh Refinement
13	11/15/11, 11/17/11	Mesh Compression
14	11/29/11, 12/1/11	Parallel Mesh Techniques
15	12/6/11, 12/8/11	Student Project Presentations
FINAL	12/13/11 (4:15-5:30pm, 333 IST)	Student Project Presentations