Instructor: Adrian Dumitrescu, EMS 1081, 229-4265, Email: dumitres@uwm.edu

Office Hours: (may change) Mon & Wed 12:40–1:30pm or by appointment.

Midterm Exam: TBA

Final Exam: TBA

Prerequisites: CS 535 or permission of instructor.


Objectives: To study basic ideas in the design and analysis of geometric algorithms.

Outline: Tentatively lectures will cover the following topics. Some topics may be skipped or assigned for self-study, and additional material may be introduced.

1. Preliminaries: basic Euclidean geometry
2. Polygons, triangulation, partitioning, visibility
3. Art gallery problems
4. Computing/detecting segment intersections
5. Convex hulls
6. Proximity
7. Voronoi diagrams
8. Delaunay triangulations
9. Geometric searching
10. Point location
11. Arrangements and duality
12. Linear programming
13. Binary space partitions
14. Approximation algorithms
15. Randomized algorithms
16. Applications to motion planning and robotics

Grading scheme: Homework and in class participation 15-20%, Overall behavior and discipline 5-10%, Midterm exam 30%, Final exam 45%.

The exams are closed books and notes. No electronic devices are permitted. Makeup exams will not be given.

Remarks: 1. Being disciplined and having an active class participation is part of your grade. This means being active in class without disrupting the class and having a positive learning attitude. You are expected to attend class and participate in the discussions (and so if you don’t attend class you will be missing points in these categories). Finding errors and/or inaccuracies in the lecture notes or textbook or on the board is encouraged.

2. In particular, the following rules of good behavior and discipline need to be respected: You need to show respect to the instructor and your colleagues and respectfully exchange ideas and opinions. You are expected to follow and participate in the discussion, and not be preoccupied with other activities. Occupy your seat before the start time of the class, and avoid leaving or entering during lecture time; If you need to leave class earlier, ask for permission beforehand. Do not bring food or drinks to class. If you send email to the instructor you need to address it properly: not by the first name, etc. When you are sick, avoid coming to class; if you still need to come (in an exceptional situation), you need to sit as isolated as possible in the back row and avoid contact with others in order to minimize the chance of transmitting your illness to others.

3. Electronic devices, including laptops, tablets, phones, etc., can only be used for class purpose, and when directed so by the instructor. In particular, recording the lectures or taking pictures are not allowed; you should rather try to follow and...
write down the information on the board
and make notes of points made during
discussion.

4. Electronic devices are prohibited during ex-
ams; any such device should be turned off
and put away (out of sight) in your bag. A
student found in possession of an electronic
device during an exam should be considered
to be engaged in academic misconduct and
should expect to receive a grade of zero on
the exam. Before any exam you need to
stow away your bag in a separate area of
the exam room; you can only retrieve your
bag after handing in your exam before leav-
ing the room.

5. If you missed a class, you should try to bor-
row the notes for that class from another
colleague. You are strongly advised to take
written notes throughout the course, since
not all topics may be covered in the text-
book or the coverage/approach might differ
from that in class. In addition, this will pre-
pare you better for the written exams.

6. Homework assignments will be given and
you will be asked to present your solutions
in class. Homework is due for discussion
usually two weeks after it was assigned.
The homework will involve about 4-5 as-
signments. While you can discuss solutions
to homework assignments with others, the
solution must be prepared independently by
you so you would be comfortable in explain-
ing it. If you discussed any assignments
with others, specify their names in your sol-
lutions. Similarly, if you use other materi-
als/sources you need to clearly specify them
in your solutions. Note that the exams may
use problems directly taken from homework
assignments, so you are strongly advised to
do the homework. It is unlikely that you will
perform well in this course without a sub-
stantial effort to work on and understand
the assignments.

7. You are expected to provide justifications
and arguments, that is, show your work,
to support your answers in all your assign-
ments and exams, regardless if the problem
explicitly asked for it or not. Unjustified
or poorly justified answers will receive little
or no credit. When you are asked to give
an algorithm for a specific problem you first
need to explain your algorithm in words
and present its main ideas; if possible, you
should also attempt to provide a sequential
enumeration of the main steps (see also the
textbook for such algorithm descriptions).

8. If you have to miss an exam or the deadline
of an assignment because of an emergency,
please contact the instructor at the earliest
possible opportunity (use both e-mail and
phone). If the instructor is not reachable,
then try to contact the department secre-
tary at 229-4677. No arrangements will be
made for missed exams, unless these rules
are followed and an acceptable evidence of
legitimate emergency is submitted.

9. Plagiarism or cheating is taking some-
one else’s work and calling it your own.
Plagiarism is not allowed and will be
dealt with severely; it is a form of
academic misconduct. In particular,
copying from other sources (including
the internet) without proper citation is
disallowed. More information on academic
misconduct is available at http://uwm.
edu/academicaffairs/facultystaff/
policies/academic-misconduct/

10. Your work will be graded not only on the
correctness of the result, but also on the
quality of presentation. An understandable
handwriting is expected.

Appendix: For illustration the following topics are
usually covered in CS 535 (with ref. to: T. Cor-
men, C. Leiserson, R. Rivest and C. Stein, Intro-
duction to Algorithms, third edition, The MIT
Press, 2009.)

1. Asymptotic notation, algorithm analysis
   [Ch. 3]
2. Recurrence relations [Chapters 2,4]
3. Lists, stacks, queues [Ch. 10]
4. Disjoint sets [Ch. 21]
5. Heaps, priority queues [Ch. 6]
6. Sorting [Chapters 2,6,7]
7. Binary search trees [Ch. 12]
8. Red-black trees [Ch. 13]
9. Dynamic programming [Ch. 15]
10. Elementary graph algorithms [Ch. 22]
11. Minimum spanning trees [Ch. 23]
12. Single-source shortest paths [Ch. 24]
13. Algorithm design techniques