THE UNIVERSITY OF SYDNEY

COMP5045: COMPUTATIONAL GEOMETRY

Semester 1, 2011 | 6 Credit Points | Mode: Normal-Day
Coordinator(s): Uwe Roehm

WARNING: This unit is an archived version! See Overview tab for delivered versions.

1. INTRODUCTION

In many areas of computer science - robotics, computer graphics, virtual reality, and geographic information systems are some examples - it is necessary to store, analyse, and create or manipulate spatial data. This course deals with the algorithmic aspects of these tasks: we study techniques and concepts needed for the design and analysis of geometric algorithms and data structures. Each technique and concept will be illustrated on the basis of a problem arising in one of the application areas mentioned above.

2. LEARNING OUTCOMES

Learning outcomes are the key abilities and knowledge that will be assessed in this unit. See assessment summary table below for details of which outcomes are assessed where. Outcomes are listed according to the course goals that they support.

Design and Problem Solving Skills (Level 4)
1. Attack theoretical and practical problems in various application domains.
2. Ability to read, understand, analyze and modify a given algorithm. Ability to design algorithmic solutions for given geometric problems.
3. Ability to analyze the complexity of a given algorithm

Fundamentals of Science and Engineering (Level 3)
4. Understand and apply important techniques and results in computational geometry.
5. Knowledge of fundamental algorithms for several problems, for example algorithms to compute convex hulls, triangulate polygons, low-dimensional linear programming and Voronoi diagrams Knowledge of fundamental general algorithmic design techniques, such as greedy, dynamic programming and divide-and-conquer.
6. Knowledge of fundamental geometric data structures such as, data structures for range searching, point location, segment intersection and ray shooting. Knowledge of fundamental general design techniques for data structures, such as multi-level trees, duality and divide-and-conquer.

Professional Communication (Level 3)
7. Argue the correctness and efficiency of a proposed solution. Mainly in writing but also orally.

For further details of course goals related to these learning outcomes, see online unit outline at http://cusp.eng.usyd.edu.au/students/view-unit-page/alpha/COMP5045 .

3. ASSESSMENT TASKS

ASSESSMENT SUMMARY

Assessment name	Team-based?	Weight	Due	Outcomes Assessed
Assignment	No	20%	Week 4	5, 6, 7
Assignment	No	20%	Week 7	2, 5, 6, 7
Assignment	No	20%	Week 11	4, 5, 6
Assignment	No	20%	Week 13	5, 6, 7
Final Exam	No	20%	Exam Period	2, 3, 4, 7

ASSESSMENT DESCRIPTION

Assignment: Assignment 1

Assignment: Assignment 2

Assignment: Assignment 3

Assignment: Assignment 4

Exam: To pass the course a minimum of 50% is required on the exam

ASSESSMENT GRADING

Final grades in this unit are awarded at levels of HD for High Distinction, DI (previously D) for Distinction, CR for Credit, PS (previously P) for Pass and FA (previously F) for Fail as defined by University of Sydney Assessment Policy. Details of the Assessment Policy are available on the Policies website at http://sydney.edu.au/policies . Standards for grades in individual assessment tasks and the summative method for obtaining a final mark in the unit will be set out in a marking guide supplied by the unit coordinator.
To pass this unit a minimum of 50% is required in the final exam.

4. ATTRIBUTES DEVELOPED

Attributes listed here represent the course goals designated for this unit. The list below describes how these attributes are developed through practice in the unit. See Learning Outcomes and Assessment sections above for details of how these attributes are assessed.

Attribute	Method
Design and Problem Solving Skills (Level 4)	In the four assignments the focus is on problem solving by applying and modifying algorithmic tools in computational geometry.
Fundamentals of Science and Engineering (Level 3)	The ability analyze exciting solutions and to state a correctness proof.
Professional Communication (Level 3)	Ability to present an algorithm and argue its correctness.

For further details of course goals and professional attribute standards, see the online version of this outline at
http://cusp.eng.usyd.edu.au/students/view-unit-page/alpha/COMP5045 .

5. STUDY COMMITMENT

Activity	Hours per Week	Sessions per Week	Weeks per Semester
Project Work - in class	12.00	1	13

Standard unit of study workload at this university should be from 1.5 to 2 hours per credit point which means 9-12 hours for a normal 6 credit point unit of study. For units that are based on research or practical experience, hours may vary. For lecture and tutorial timetable, see University timetable site at: web.timetable.usyd.edu.au/calendar.jsp

6. TEACHING STAFF AND CONTACT DETAILS

COORDINATOR(S)

Name	Room	Phone	Email	Contact note
A/Prof Roehm, Uwe		9036 5305	uwe.roehm@sydney.edu.au	Consultation Time: Wednesdays, 2-3pm

LECTURERS

Name	Room	Phone	Email	Contact note
Dr Gudmundsson, Joachim		02 9351 4494	joachim.gudmundsson@sydney.edu.au	

7. RESOURCES

PRESCRIBED TEXTBOOK(S)

M. de Berg, O. Cheong, M. van Kreveld and M. Overmars., *Computational Geometry: Algorithms and Application* (3rd edition). Springer-Verlag, Heidelberg, 2008. 978-3-540-77973-5.

COURSE WEBSITE(S)

Blackboard Learn

8. ENROLMENT REQUIREMENTS

ASSUMED KNOWLEDGE

Students are assumed to have a basic knowledge of the design and analysis of algorithms and data structures: you should be familiar with big-Oh notations and simple algorithmic techniques like sorting, binary search, and balanced search trees.

PREREQUISITES

None.

9. POLICIES

IMPORTANT: School policy relating to Academic Dishonesty and Plagiarism.

In assessing a piece of submitted work, the School of IT may reproduce it entirely, may provide a copy to another member of faculty, and/or to an external plagiarism checking service or in-house computer program and may also maintain a copy of the assignment for future checking purposes and/or allow an external service to do so.

Other policies

Faculty policies regarding academic honesty and plagiarism, special consideration and appeals in Engineering and Information Technologies can be found on the Faculty's policy page at http://www.eng.usyd.edu.au/policies. School and Faculty policies are governed by Academic Board resolutions whose details can be found on the Central Policy Online site at http://www.usyd.edu.au/policy/.

Policies regarding assessment formatting, submission methods, late submission penalties and assessment feedback depend on the unit of study. Details of these policies, where applicable, should be found above with other assessment details.