



**University of Tehran**  
**School of Electrical and Computer Engineering**

<b>Course</b>	Computational Geometry		
<b>Course type, level, credit</b>	Optional	Graduate	3 units
<b>Field, Major</b>	Computer Engineering	Software	
<b>Co-requisite(s)</b>	-		
<b>Prerequisite(s)</b>	-		
<b>Prerequisite by topic</b>	Data structures and design and analysis of algorithms		
<b>Goals</b>	The aim of this course is to teach the algorithms used in solving problems in geometric domains. The content of the course is designed in a way that the students learn basic skills and techniques to design and analyze such algorithms. These techniques include the related data structures and algorithms.		
<b>Outcome</b>	<p>Upon successful completion of the course, students will ...</p> <ol style="list-style-type: none"> <li>1. know the basic notions related to geometric domains</li> <li>2. be able to design algorithms in geometric domains</li> <li>3. be able to analyze the complexity of the algorithms</li> <li>4. be able to use geometric algorithms in related application domains.</li> </ol>		
<b>Topics</b>	<ol style="list-style-type: none"> <li>1. Convex Hulls</li> <li>2. Polygon Intersection</li> <li>3. Polygon Triangulation</li> <li>4. Linear Programming</li> <li>5. Point Location</li> <li>6. Orthogonal Range Searching</li> <li>7. Geometric Data Structures</li> <li>8. Shortest Paths in Geometric Domains</li> <li>9. Robot Motion Planning</li> <li>10. Kinetic Data Structures</li> <li>11. Visibility Problems</li> </ol>		
<b>Required software</b>	CGAL Computational Geometry Library		

<b>Assignments</b>	Around seven homeworks and paper review
<b>Projects</b>	-
<b>Grading</b>	Assignments and quiz: 10 % Paper Review: 10 % Midterm exam: 40 % Final exam: 40 %
<b>Textbook(s)</b>	[1] Satyan Devadoss and Joseph O'Rourke, Discrete and Computational Geometry, Princeton University Press, 2011. [2] Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars Computational Geometry: Algorithms and Applications, 3rd Edition, Springer, 2008.
<b>Further readings</b>	[1] Csaba D. Toth, Joseph O'Rourke, and Jacob E. Goodman, Handbook of Discrete and Computational Geometry, 3 <sup>rd</sup> Edition, CRC Press, 2014.