SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babes-Bolyai University Cluj-Napoca**	
1.2 Faculty	**Faculty of Mathematics and Computer Science**	
1.3 Department	**Department of Computer Science**	
1.4 Field of study	**Computer Science**	
1.5 Study cycle	**Bachelor**	
1.6 Study programme / Qualification	**Computer Science**	

2. Information regarding the discipline

2.1 Name of the discipline	**Computational Geometry**						
2.2 Course coordinator	**Lect. Dr. Liana Topan**						
2.3 Seminar coordinator	**Lect. Dr. Liana Topan**						
2.4. Year of study	**3**	2.5 Semester	**5**	2.6. Type of evaluation	**C**	2.7 Type of discipline	**Elective Course**

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	1+1
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					25
Additional documentation (in libraries, on electronic platforms, field documentation)					15
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					20
Evaluations					14
Other activities:					-

3.7 Total individual study hours	94
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	• Elementary knowledge in geometry • Average programming skills

5. Conditions (if necessary)

5.1. for the course	
5.2. for the seminar /lab activities	• Lab with computers

6. Specific competencies acquired

Professional competencies	• C3.3 Utilizarea modelelor si instrumentelor informatice si matematice pentru rezolvarea problemelor specifice domeniului de aplicare • C4.3 Identificarea modelelor si metodelor adecvate pentru rezolvarea unor probleme reale
Transversal competencies	• CT1 Aplicarea regulilor de muncă organizată şi eficientă, a unor atitudini responsabile faţă de domeniul didactic-ştiinţific, pentru valorificarea creativă a propriului potenţial, cu respectarea principiilor şi a normelor de etică profesională

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• Ability to understand and approach problems of modeling nature from other sciences
7.2 Specific objective of the discipline	• The purpose of the course is to present an introduction in algorithmic geometry and some tools used in applied mathematics, information technology and some other scientific domains. • The labs facilitate a better understanding of the theoretical notions

8. Content

8.1 Course	Teaching methods	Remarks
1. Convex Hulls in the Plane. Degeneracies and Robustness.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
2. Convex Hulls. The Constructions of Convex Hulls in the Plane	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
3. Segment Intersection. The Doubly-Connected Edge List	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
4. Computing the Overlay of Two Subdivisions	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
5. The Art Gallery Problem. Triangulations	• Interactive exposure • Explanation • Conversation • Didactical	

	demonstration	
6. Partitioning a Polygon into Monotone Pieces. Triangulating a Monotone Polygon	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
7. Half-Plane Intersections	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
8. Point Location and Trapezoidal Maps	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
9. A Randomized Incremental Algorithm for Point Location. Dealing with Degenerate Cases	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
10. The Post-Office Problem. Voronoi Diagrams	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
11. Voronoi Diagrams of Line Segments. Farthest Point Voronoi Diagram	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
12. Delaunay Triangulations	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
13. Convex Hulls in 3-Space	• Interactive exposure • Conversation	
14. Convex Hulls and Half-Space Intersection	• Interactive exposure • Conversation	

Bibliography

1. DE BERG, M. - VAN KREFELD, M. - OVERMARS, M. - SCHWARZKOPF, O.: Computational Geometry. Algorithms and Applications, (3rd edition), Springer, 2008
2. CHEN, J. - Computational geometry. Methods and applications, Texas AM, 1996
3. MOUNT, D., Lectures in Computational Geometry, 1997
4. O'ROURKE, J.: Art Gallery Theorems and Algorithms, Oxford University Press, 1987
5. O'ROURKE, J.: Computational Geometry in C, Cambridge University Press, 1994

Additional references

1. BOISSONNAT, J.-D. - YVINEC, M.: Algorithmic Geometry, Cambridge University Press, 1998
2. CORMEN, T.H. - LEISERSON, C.E. - RIVEST, R.L.: Introduction to Algorithms, The MIT Press, Cambridge, Massachusets, 1990
3. EDELSBRUNNER, H.: Algorithms in Combinatorial Geometry, Springer, 1997
4. PREPARATA, F.P. - SHAMOS, M.I.: Computational Geometry, Springer, 1985

8.2 Seminar / laboratory	Teaching methods	Remarks
1/2 Implementation of Graham's Algorithm	case studies, examples	
3/4 Search and Intersection	case studies, examples	
5/6 Triangulations. Implementation	case studies, examples	
7/8 Linear Time Triangulation. Implementation	case studies, examples	
9/10 Implementation of Incremental Algorithm	case studies, examples	
11/12 Algorithms for Delaunay Triangulation	case studies, examples	
13/14 Implementation of Incremental Algorithm	case studies, examples	

Bibliography

1. DE BERG, M. - VAN KREFELD, M. - OVERMARS, M. - SCHWARZKOPF, O.: Computational Geometry. Algorithms and Applications, (3rd edition), Springer, 2008
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9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- The course respects the IEEE and ACM Curriculla Recommendations for Computer Science studies;
- The course exists in the studying program of all major universities in Romania and abroad;

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	- know the basic principle	First midterm (written)	20%
	of the domain;	Second midterm (written)	20%
	- apply the course	Final exam (written)	20%
	concepts		
10.5Seminar/lab activities	- be able to implement course concepts and algorithms	portofolio -continous observations	40%
10.6 Minimum performance standards		At least grade 5 (from a scale of 1 to 10) at both written exams and laboratory work.	

Date | Signature of course coordinator | Signature of seminar coordinator

30.04.2014

Date of approval | Signature of the head of department