

Module Handbook

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Course INF-11-52-K-5

Computational Geometry (2V+1U, 4.0 LP)

Course Type

SWS	Type	Course Form	CP (Effort)	Presence-Time / Self-Study
-	K	Lecture with exercise classes (V/U)	4.0 CP	78 h
2	V	Lecture		28 h
1	U	Exercise class (in small groups)		14 h
(2V+1U)			4.0 CP	42 h 78 h

Basedata

SWS	2V+1U
CP, Effort	4.0 CP = 120 h
Position of the semester	1 Sem. in WiSe
Level	[5] Master (Entry Level)
Language	[DE/EN] German or English as required
Lecturers	Garth, Christoph, Prof. Dr. (PROF DEPT: INF)
Area of study	[INF-VIS] Visualisation and Scientific Computing
Lifecycle-State	[NORM] Active

Possible Study achievement

- Verification of study performance: **proof of successful participation in the exercise classes (ungraded)**
- Details of the examination (type, duration, criteria) will be announced at the beginning of the course.

Contents

Formal Foundations

- Foundations of Computational Geometry
- Relevant Operations on Spatial Data
- Efficient Data Structures for Spatial Data
- Algorithm Design Strategies:
 - sweep-line algorithms
 - randomized algorithms
 - output-sensitive algorithms
- Runtime and memory analysis of complex geometric algorithms
- Duality transforms and duals of an object

Sweep-Line Algorithms

- Convex Hull
- Line Segment Intersection
- Polygon Triangulation
- Voronoi Diagrams

Randomized Algorithms

- BSP Tree Construction
- Trapezoidal Maps
- Delaunay Triangulation

Efficient spatial data structures and their applications

- Quadtrees and Octrees
- Binary-space-partition (BSP) Trees
- kd-Trees and Range Trees
- Trapezoidal Maps

Literature

- J. O'Rourke: Computational Geometry in C, Cambridge University Press, 1998.
- H. Edelsbrunner: Geometry and Topology of Mesh Generation, Cambridge University Press, 2001.
- M. de Berg, M. van Kreveld: Computational Geometry — Algorithms and Applications, Springer, 2000.
- current scientific literature.

Requirements for attendance (informal)

Courses

- [INF-10-03-K-5] Computer Graphics (4V+2U, 8.0 LP)

Requirements for attendance (formal)

None

References to Course [INF-11-52-K-5]

Module	Name	Context	
[INF-11-52-M-5]	Computational Geometry	P: Obligatory	2V+1U, 4.0 LP

Course-Pool	Name
[INF-VIS_V-KPOOL-6]	Lectures of the teaching area Visualization and Scientific Computing