INFO-6019 – Physics and Simulation 1

Week 1: Design issues and general concepts:

* Geometry
* Objects
* Animation
* Time
* Response
* Performance
* Robustness

Week 2: Discrete mat (2D and 3D)

* Coordinate Systems and points
* Vectors
* Barycentric Coordinates
* Lines, rays, and Voronoi Regions
* Minkowski Sum and Difference
* Matrices
* Numerical robustness

Week 3: integration (Euler)

Week 4-6: Bounding Volumes and Basic Primitive Tests

* Spheres
* Axis-Aligned Bounding Boxes
* Oriented Bounding Boxes
* Sphere-swept Volumes
* Polygons
* Closest-point computations
* Testing Primitives
* Intersection Lines, Rays, and Segments
* Dynamic Intersection Tests (tunnelling and swept volumes)

Week7: Mid-term

Week 8: Particle systems & Soft body (Verlet)

Week 9: Convex objects

* Boundary based
* Hierarchical Polyhedron representations
* Linear and Quadratic Programming
* Proximity Queries
* Other techniques (for instance: Gilbert-Johnson-Keerthi, etc.)

Week 10-12: Spatial data structures and partitioning

* Axis Aligned Bounding Boxes (AABBs)
* Oriented Bounding Boxes (OBBs)
* Uniform grids
* Hierarchical grids
* Trees
* Sort and Sweep (Broad Phase) methods
* Cells and Portals

Week 13: Other integration techniques:

* Mid-point integration
* Runge-Kutta (RK-4) integration

Week 14: Geometric Robustness, Optimization