THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Computer Game and Animation Techniques

CSE 3541

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)

Course Components:
Lecture

Course Description:
Fundamental algorithms and mathematics in production of computer animation and video games, emphasizing control and rendering of animated characters.

Prerequisites and Co-requisites:
Prereq: 3901, 3902, or 3903; and enrollment in CSE, CIS, Music (BS), or ECE major.

Course Goals / Objectives:
- Be competent with basic interpolation techniques, speed control along a path, and automatic banking into curves along a path
- Be competent with forward and inverse kinematics or articulated linkages
- Be competent with physics-based animation
- Be competent with behavioral animation
- Be competent with the generation and processing of sound in games and animation
- Be competent with the use of AI techniques in games
- Be competent with software architectures for computer games
- Be competent with the concept of a rendering pipeline and graphics state
- Be competent with hierarchical scene graphs and hierarchical animation
- Be familiar with computational issues associated with computer animation
- Be familiar with control devices for computer games and framework support for event notification
- Be exposed to computer animation production technology
- Be exposed to motion capture technology and its use in computer animation
- Be exposed to the history of animation and computer animation

Course Topics:

- Overview, history, and foundation of computer games and computer animation
- Matrices and transformations
- Path-based animation; linear, cubic interpolation; splines, path following; acceleration, speed control; ease-in/ease-out; orientation rep., interpolation; quaternions, path following; Frenet Frame, banking, interpolation-based animation
- Hierarchical modeling and animation: inverse kinematics, other IK techniques
- Review of numerical integration
- Constrained motion: ground clamping, collision detection, constrained physics
- Review of physics: gravity, friction, rigid body, spring-mass systems, particle systems, collision response
- Human figure animation: anatomy, biomechanics
- Mocap, including visit to mocap lab; motion databases
- Behavioral animation: flocking, prey-predator model
- Crowd modeling: cellular and continuous models
- Flexible body animation: non-uniform scaling, spring-mass-damper systems, blend shapes
- Efficient and effective basic human motion modeling: reaching, grasping, walking/running, expressions, speech
- Sound: physically based, sound effects
- Rendering overview: models, textures, lights and cameras
- Overview of AI in computer games
- Scene management using octrees and cells and portals

Designation:

Elective