Course number/name: MECH 4800 Advanced 3D Animation

Credits/contact hours: 3 credits, 2 class hours, 2 lab hours

Instructor/coordinator: Masato Nakamura, Assistant Professor of Mechanical Engineering Technology

Text book/title/author/year

Specific course information
Catalog description: Extends techniques learned in earlier industrial design courses (IND 2313 and IND 2410) and builds upon theories introduced in earlier animation courses (such as IND 2420). Foundation for advanced animation construction, incorporation of and integration with external media, and techniques to automate and optimize development processes. Dynamic particles, flexible soft body creation, texturing, “hair” particles, fluid simulation, rigging, lighting, and plant simulation.

Pre/Corequisites: MECH3510

Required/elective/selected elective: Selected elective for Mechanical Engineering Technology (Industrial Design Concentration [General Concentration])

Course learning objectives:
1. Understand the basics of modeling. Demonstrate skills in model preparation and theory, workflow, and texturing.
2. Use rigging. Display competency in create skeleton, use control rig, and apply skinning.
3. Create human body mechanism. Illustrate skills in creating mechanism of human body movements that can be applied to biomechanics, such as jaws, the eyes, lips, including face control, and creating facial movement.
4. Create a virtual physical world. Demonstrate skills in using simulation and non-simulation tools and technique.
5. Create dispersion of particles. Display competency and skills in creating various particle models such as fire, smoke, engine emission.
6. Create flexible soft bodies and cloth. Demonstrate ability in understanding soft body basics, applying force field and collision, using stress-mapped textures for rubbery surfaces, and simulation cloth.
7. Create a motion of fluids. Demonstrate skills in simulating fluids, creating a splash, creating inflow and outflow, creating obstacles and animations.
8. Create a motion of hair by air flow. Demonstrate skills in creating hair particles, applying texture mapping and lighting and rendering.

6/10/2014 Dr. Masato Nakamura updated
Course addresses ABET student outcomes: 3a, 3b, 3c, 3d, and PC-1

Brief list of topics to be covered:

- Introduction and Overview. Advanced modeling techniques, discussion of course expectations, projects, and exams. Laboratory work: Overview of Maya and other animation software. Familiarize with Maya and other animation tools used in animation industry.

- Advanced Modeling. Polygonal modeling, Subdivision modeling, and Nurbs modeling. Laboratory work: Hands-on Practice on Maya or other animation tools. Running sample animation models using the software provided.

- Rigging. Creating joints and controllers, Creating skeletons, Forward and Backward kinematics. Laboratory work: Rigging Project. Creating a model with joints and controllers to meet various design criteria.

- Create human body mechanism. Human body movements that can be applied to biomechanics, such as jaws, the eyes, lips, including face control, and creating facial movement. Laboratory work: Rigging Project (Continued).

- Creating Photo-Realistic Objects. Use of materials and texture, Create bodies of water, faking a cloth flag, Faking physics with general tools. Laboratory work: Project II. Creation of a Model using simulation and Non-simulation tools and techniques.

- Creating dispersion of particles. Setting particle parameters, Setting visualization options, Working with dynamic particles, Creating fire, smoke and engine emission. Laboratory work: Project II (Continued).

- Flexible Bodies and Cloth. Understanding soft body basics, Using force fields and collision, working with soft bodies and curves, Simulating cloth. Laboratory work: Project III. Creation of a Soft Body Model.

- Flexible Bodies and Cloth. Understanding soft body basics, Using force fields and collision, working with soft bodies and curves, Simulating cloth. Laboratory work: Project III (Continued).

- Create a motion of fluids. Computational Fluid Dynamics (CFD), Geometry creation. Mesh building, Definition of physical models, equation of motion, enthalpy, radiation, energy and mass conservation, boundary conditions. Project IV. Creating a motion of fluids. Gas (air), or liquid (water)