

## Course Syllabus:

1. **8:30-8:45 Course Introduction - Ebert** 1-1
2. **8:45-9:45 Fractal Landscapes in Their Natural Context - Musgrave** 2-1
  - A. Random Fractals
    1. Fractional Brownian motion
    2. Variations on fractional Brownian motion
    3. Multifractals
  - B. Modeling and Rendering Terrain Models
    1. Discrete height fields
    2. Continuous height fields
  - C. Planetary Models
    1. Motivation
    2. QAEB
3. **9:45-11:00 Water More Real Than Real- Tessendorf** 3-1
  - A. Environment Components (waves, atmosphere, water volume)
  - B. Ocean Wave Phenomenology (deep water waves)
    1. Statistical wave models
    2. FFTs and random ocean realizations
    3. Wave animation
    4. Nonlinear wave action
  - C. Water Surface Optics
    1. Fresnel reflection and transmission of skylight
    2. Glitter modeling
  - D. Water Volume Reflection and Transmission
    1. Water volume reflection models
    2. Refraction focusing and defocusing
    3. Water attenuation models
    4. Underwater POV
      - a. Refracted skylight
      - b. Refracted sunlight - caustics
      - c. Scattered sunlight - sunbeams
    5. Underwater imaging - scattering and blurring
4. **11:00-12:00 Modeling Rotational Motion In Water and Smoke - Foster** 4-1
  - A. The Dynamics of Natural Rotational Motion
    1. Convection and Drag
    2. Temperature
    3. Navier Stokes equations
  - B. Isolating and Modeling Key Visual Components
    1. Environment simplification
    2. Physics simplification
  - C. Hacking for Effect
    1. Interaction with objects
    2. Practical animation

- 5. **1:30-2:30 Procedural Volumetric Cloud Modeling and Animation - Ebert** 5-1
  - A. Introduction To Volumetric Cloud Modeling
  - B. Volumetric Implicit Models
    - 1. Basics of volumetric implicits
    - 2. Modeling and rendering issues
  - C. Simulating Clouds
    - 1. Cumulus clouds
    - 2. Stratus clouds
    - 3. Cirrus clouds
    - 4. Sunset effects
  - D. Simulating Cloud Dynamics With a Particle System Approach
  
- 6. **2:30-3:45 Modeling Plants and Plant Ecosystems - Prusinkiewicz** 6-1
  - A. Modeling Plants
    - 1. Bottom-up modeling: Simulation of plant development
    - 2. Top-down modeling: Inferring plant structure from global characteristics
    - 3. Parameterization and control of plant models
  - B. Modeling Plant Ecosystems
    - 1. Overview: The concept of multilevel modeling
    - 2. Modeling plant distribution
    - 3. Populating a scene with realistic plant models
    - 4. Harnessing scene complexity using approximate instancing
    - 5. Case studies
  
- 7. **3:45-4:45 Looking Over a Four Leaf Clover: Strategies in Dressing Natural Environments In *A Bug's Life* - Vincelette** 7-1
  - A. Introduction to the Rich, Organic, Evolving Environments in *A Bugs Life*
  - B. Combining Techniques and Artistic Directions to Attain the Rich Variety of Organic Nature
    - 1. Use of single generic models to create various distinct looking objects
    - 2. Need for multiple levels of complexity in models to dress large areas
    - 3. Shaders' multiple controls allow great diversity;
    - 4. Mix of shaders and real geometry to enhance the look in each set.
  
- 8. **4:45-5:15 Panel Session / Q&A - All**
  - A. Future Directions of Research
  - B. Practical Challenges
  - C. Key Unsolved Problems
  - D. Contrast of the Approaches Presented Today

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