# Model Syllabus for TCSS 491
# Version: May 2012
# (Approved May 11, 2012)

**Catalog Description**

Explores selected topics in the areas of advanced imaging, virtual reality, computational intelligence, and artificial life. Students work in teams to develop a medium-size application integrating multiple areas of knowledge. Specific topics may include graphics and physics engines, scientific computation, and distributed virtual environments. Prerequisites: TCSS 458.

**Preconditions**

- Define primitive shapes and spatial relationships using coordinate systems.
- Define and apply coordinate transformations using matrices.
- Describe the major stages of a standard rendering pipeline.
- Utilize lighting capabilities to illuminate a user-created scene.
- Adapt/extend a data structure to provide new functionality.

**Course Student Learning Goals** (to be added to syllabus handed out to students)

- Describe the basic principles and design of graphics engines, physics engines, and distributed systems.
- Employ mathematical theory within an application involving significant numerical calculation.
- Implement and utilize advanced data structures, e.g., scene graphs, binary space partitioning trees.

**CSS Degree Student Learning Outcomes that this course contributes to** (to be added to syllabus handed out to students).

a. an ability to apply knowledge of computing and mathematics appropriate to the discipline;

b. an ability to analyze a problem, identify and define the computing requirements appropriate to its solution;

c. an ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;

d. an ability to function effectively on teams to accomplish a common goal;

**UWT Student Learning Goals that this course contributes to** (to be added to syllabus handed out to students)

*Inquiry and Critical Thinking*
Students will acquire skills and familiarity with modes of inquiry and examination from diverse

disciplinary perspectives, enabling them to access, interpret, analyze, quantitatively reason, and synthesize information critically.

**Suggested Topics**

- Graphics principles review
- Physics engines
    - Newtonian mechanics
    - Discrete simulation
    - Numerical stability
    - Collision detection and resolution
- Distributed systems
    - Models of distributed computing
    - Overlay networks, e.g., peer-to-peer networks.
- Artificial life
    - Cellular automata, e.g., Conway's Game of Life.
    - Evolutionary algorithms
    - Scientific experimental design