

Proposal For A New Non-General Education Course:

Computer Animation

1. Details

- a. **Course Title:** Computer Animation
- b. **Sponsor:** Adrian Rusu, Computer Science Department, Rowan University.
- c. **Semester hours:** 3
- d. **Course Level:** Graduate.
- e. **Prerequisites:** (Linear Algebra (1701.210) or Math for Engineering Analysis II (1701.236)) and Physics with Calculus I (1902.200).
- f. **Suggested Time and Scale of Implementation:** This course is to be offered every other year, or based on demand.

2. Curricular Effect

This course will be an elective for students in graduate programs within the University, such as those in the Master of Arts Higher Education program who specialize in Computer Science. A Computer Animation course will increase the number and variety of those electives making University's curriculum more attractive to prospective and current graduate students. This course will examine the field of Computer Animation, exposing students to existing and developing computer animation algorithms and techniques.

- **Offerings:** No class will be dropped as a result of this course.
- **Adequacy of Resources:** The current computers & software available in the open labs and computer science advanced lab are adequate to carry out this course at the present time. However it is fully expected that the equipment will need to be regularly upgraded to support this course, as well as all of the courses in our major. Thus it is, of course, necessary that a reasonable replacement cycle be maintained.
- **Recommended Library Resources:** Current library resources are adequate.
- **Short-term Evaluation:** This course has not been offered previously.

3. Rationale

Computer animation is one of the most rapidly expanding areas of creative endeavor and technical development. Computer-generated sequences in feature films and television, digital special effects in feature films, computer-animated simulator rides, computer games and virtual environments are some of the more visible applications of 3D computer animation.

The expansion of the market and the application areas of computer animation are predicted to have an explosive growth for many years to come. Well-qualified professionals in this area are, and will, in the foreseeable future, continue to be in great demand internationally and command substantial rewards.

Over the past ten years both the technology and the creative application of this technology have reached such a level of maturity and sophistication that a number of quite distinct and specialized application areas are emerging. Such areas are **computer animation, digital special effects, and computer games.**

Currently, there is no course that covers Computer Animation for graduate students. This course will help to fill this gap and will strengthen the department's current offering of electives for graduate students, in accordance with expertise of new faculty in Department of Computer Science. The course will also serve as an elective for students pursuing graduate degrees in other departments on campus. In practice, this course will frequently be offered concurrently with an undergraduate course Introduction to Computer Animation, which is being proposed at the same time. Students will be required to study in depth and complete in-depth assignments from each topic covered in class. Students will be required to complete in-depth projects, such as projects born from research-oriented topics. In addition, students will be required to read, summarize, and present in class at least two recent conference or journal papers from the computer animation literature on their chosen research topic, and will be required to prepare term papers with regard to a computer animation research topic.

4. Essence of the Course

- a. **Objectives in Relation to Student Outcomes:** Upon completion of this course, students will be able to:
 - explain and apply the fundamentals of keyframing and interpolation
 - apply models of motion based on Newtonian Physics to animation
 - describe and compare models of group behavior and apply them to animation
 - apply advanced techniques for animating articulated figures
 - explain advanced principles of motion capture and apply them to an animation application
 - understand the theories behind computer animation
 - specify, design, implement, and document a large software project related to computer animation
 - be able to understand computer animation state-of-the-art research and trends

- b. **Topical Outline/Content:**
 - Keyframing / Interpolation
 - Rigid Body Dynamics
 - Articulated Figure Motion

- Forward Kinematics
- Inverse Kinematics
- Walking
- Motion Capture
- Group Behavior
 - Flocking
 - Particle Systems
- Advanced character animation
 - Use of genetic algorithms
 - Procedural Gesturing
 - Levels of Control
- Facial Animation
- Animation and Sound
- Automatic Camera Control
- Animated Lighting
- Animation of Natural Phenomenon (Fire, Smoke, Plants)
- Animating surfaces
 - Soft objects
 - Cloth Animation
 - Hair and Fur
- Advanced Topics in Computer Animation

c. Evaluation of students and grading procedure: Students will be evaluated by traditional methods such as homework and projects assignments, quizzes, presentations, and exams.

d. Course Evaluation: This course will be evaluated through student surveys, as well as by the Computer Science Accreditation Commission when our major is to be re-evaluated in 2006.

5. Consultations

- a. Management & M.I.S.
- b. Electrical & Computer Engineering
- c. Mathematics
- d. Physics

6. Catalog Description

0707.580 (Suggested hegis number)

3 s.h.

Computer Animation

(Prerequisite: (1701.210 or 1701.236) and 1902.200)

This is a graduate level course in Computer Animation that takes a look at Computer Animation from a programmer's perspective. It will investigate the theory, algorithms, and techniques for describing and programming motion for virtual 3D worlds. Approaches that will be explored include keyframing systems, kinematics, motion of articulated figures, and procedural and behavioral systems. Students will be required to complete in-depth assignments, read, summarize, and present recent journal papers from the computer animation literature, and prepare term papers with regard to a computer animation research topic. Students will also be required to specify, design, implement, and document a semester-long software project related to computer animation.