



# MODELING AND SIMULATION

FLDOE Curriculum Frameworks  
Submitted by Seminole County Public Schools  
In Partnership with the National Center for Simulation



## PROGRAM RATIONALE

- In recent years, the Modeling and Simulation industry has experienced significant growth.
- The Central Florida Research Park is a major innovation hub where thousands of Floridians work in the simulation and defense industries.
- Application of simulation technology has expanded to a variety of fields including healthcare, engineering, logistics, computer programming/animation, software development, and other IT specialties.
- Increasing demand for skilled, high-wage Modeling and Simulation employees, it is now more essential than ever to introduce Florida's high school students to this dynamic, interdisciplinary area of study.



## WHAT ARE THE FLORIDA CURRICULUM FRAMEWORKS?

- The Florida curriculum frameworks are documents that guide career and technical education instruction across the state of Florida.
- Frameworks are aligned with career clusters delineated by the US Department of Education.
- Frameworks guide classroom instruction and serve as an outline to what content students are accountable for mastering at the end of each course.
- These documents also provide guidelines for multiyear implementation, required teacher certification and prerequisite knowledge for students.

## THE FRAMEWORK DEVELOPMENT PROCESS

- Curriculum Development by the National Center for Simulation
- SCPS implementation of the Hagerty High School Modeling and Simulation Program of Emphasis.
- Modeling and Simulation Advisory Council Established
- Framework review and finalization
- SCPS Board Approval September 23, 2014
- Pending DOE Approval/Feedback



THE NATIONAL CENTER  
FOR SIMULATION





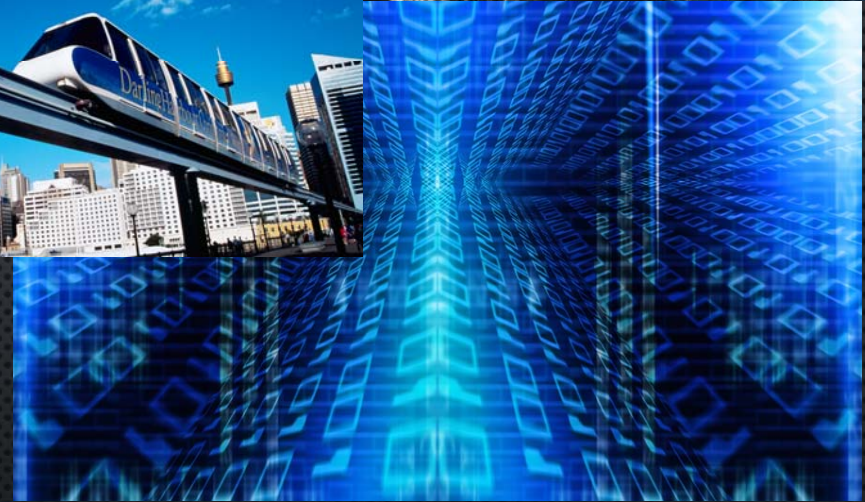
## ESSENTIAL PROGRAM ELEMENTS

- The four-year Modeling and Simulation framework will be added to the Information Technology career cluster for 2015-16 school year so that students may develop the skills, knowledge and expertise necessary to pursue a variety of career opportunities in Modeling and Simulation and other essential IT and STEM-related fields.
- Emphasis is placed on interdisciplinary study in the fields of science, computer programming, mathematics, gaming and simulation, robotics, geospatial/geographic information systems and 2-D/3-D Art.
- Elements of leadership, innovation, prototyping and entrepreneurship are embedded in each year of the program.
- The program challenges students to apply their skills, knowledge and talents to real world problems.



## Potential Careers/SOC Codes

Command and Control Center Specialist  
Military Enlisted Tactical Operations  
Military Enlisted Air/Weapons Specialists  
Medical Scientists, Except Epidemiologists  
Transportation Planners  
Logisticians  
Software Developers, Applications  
Computer Programmer  
Mathematicians  
Architectural and Engineering Managers  
Atmospheric and Space Scientists





## COURSE PROGRESSION, LEVEL AND RECOMMENDATIONS

Course Number	Course Title	Length	SOC Code	Level
	Modeling and Simulation Foundations	1 credit		2
	Modeling and Simulation Design	1 credit		2
	Modeling and Simulation Applications	1 credit		3
	Modeling and Simulation Prototyping and Innovation	1 credit		3

- **This program provides technical skill proficiency and includes competency-based applied learning through the use of hands-on labs and the development of a multi-year portfolio.**
- **To further enrich this course sequence it is recommended students take a sequence of electives in either visual arts, computer arts, or digital arts including but not limited to Computer Programming, Web Design, 2D and 3D Art, Gaming and Animation, Robotics and/or Geospatial/Geographic Information Systems Technology.**
- **The Modeling and Simulation program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with Modeling and Simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.**

# CULMINATING ACTIVITIES

## Modeling and Simulation Foundations

Creation of a visual model to aide in the development of a professional portfolio.

## Modeling and Simulation Design

Creation of a simple 3D simulation design to aid in the development of a professional portfolio.

## Modeling and Simulation Applications

Rendering of a complex 3D simulation Design to aid in the development of a professional portfolio.

## Modeling and Simulation Innovation/Prototyping

Completion of a capstone project to demonstrate competency in the field of modeling and simulation research, design and practice and to Aide in the completion of a professional portfolio.



- 01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Modeling and Simulation.**
- 02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Modeling and Simulation.**
- 03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Modeling and Simulation.**
- 04.0 Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge.**
- 05.0 Demonstrate information fluency using emerging research techniques and technology.**
- 06.0 Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to Modeling and Simulation.**
- 07.0 Explain intelligent systems as they relate to modeling, simulation and data analysis.**
- 08.0 Develop an understanding of programming languages as they relate to modeling and simulation.**
- 09.0 Demonstrate knowledge of different operating systems.**
- 10.0 Explore software evolution and lifecycle as it relates to modeling and simulation.**
- 11.0 Demonstrate an understanding of visual modeling in relation to the production process.**
- 12.0 Understand the role of texture artists in relation to the production process.**
- 13.0 Demonstrate knowledge of basic materials and textures.**
- 14.0 Demonstrate knowledge of basic lighting.**
- 15.0 Explain visual simulation.**



- 16.0 Explain distributed simulation.
- 17.0 Explain environmental models.
- 18.0 Use visual modeling techniques and software to create an environmental model.
- 19.0 Understand the production process of modeling, simulation and entertainment.
- 20.0 Demonstrate knowledge of basic animation.
- 21.0 Demonstrate knowledge of basic 3D rendering.
- 22.0 Demonstrate basic understanding of modeling principles.
- 23.0 Analyze model fidelity as related to modeling and simulation techniques.
- 24.0 Explain object models.
- 25.0 Demonstrate an understanding of mathematical modeling in relation to the production process.
- 26.0 Explain agent-based simulation.
- 27.0 Demonstrate knowledge of photo editing software.
- 28.0 Demonstrate knowledge of video editing software.
- 29.0 Incorporate audio assets into a modeling and simulation engine.
- 30.0 Utilize basic audio production techniques, sound construction, and editing techniques as related to modeling and simulation
- 31.0 Apply industry standards for 3D animation software and user interface to create 3D basic and complex models.
- 32.0 Demonstrate knowledge of rigging.
- 33.0 Demonstrate knowledge of basic character setup.
- 34.0 Demonstrate knowledge of motion capture systems.



- 35.0 Use the production process and relevant modeling and simulation techniques and software to design simple 3D simulation.**
- 36.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Modeling and Simulation.**
- 37.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Modeling and Simulation.**
- 38.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Modeling and Simulation.**
- 39.0 Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices, etc.**
- 40.0 Build a simple scenario for experimentation or training.**
- 41.0 Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation.**
- 42.0 Demonstrate an understanding of 3D modeling and simulation software engines.**
- 43.0 Understand systems engineering for simulators.**
- 44.0 Use real time technology to model and simulate environments.**
- 45.0 Demonstrate an understanding of underlying principles of numerical analysis and how it relates to modeling and simulation.**
- 46.0 Analyze numerical characteristics of univariate data sets to describe patterns and departure from patterns, using statistics for various distributions.**
- 47.0 Use probabilities (relative frequency and theoretical), to plan and conduct an experiment that will address control, randomization and measurement of experimental error.**



- 48.0 Use programming to develop modeling and simulation applications.
- 49.0 Test programs related to modeling and simulation.
- 50.0 Perform program maintenance to troubleshoot and optimize code.
- 51.0 Plan program design using object oriented programming (OOP) for modeling and simulation.
- 52.0 Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling.
- 53.0 Demonstrate knowledge of polygon modeling.
- 54.0 Demonstrate knowledge of animation principles as it relates to the underlying physics of modeling.
- 55.0 Use the production process and relevant modeling and simulation techniques and software to render a complex 3D simulation.
- 56.0 Explain and utilize project management and logistics to create and develop 3D modeling and simulation products.
- 57.0 Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets.
- 58.0 Apply the principles of entrepreneurship to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production.
- 59.0 Use innovative technologies to create prototypes of models.
- 60.0 Create and design vector or bitmap art reference to develop a 3D modeling texture map to build a model for simulation.
- 61.0 Demonstrate the use of experimental and engineering design techniques to produce real world or industry simulations.
- 62.0 Demonstrate an understanding of underlying principles of discrete event simulation and how it relates to modeling and simulation.
- 63.0 Implement multimedia programming as it relates to modeling and simulation using a gaming engine.
- 64.0 Use innovative technologies to create prototypes of models.



**Stephanie Wall**  
**Teacher on Assignment**  
**ePathways**

**Office: 407-320-0174**

**Cell: 321-262-5152**

**[Stephanie\\_wall@scps.us](mailto:Stephanie_wall@scps.us)**