**Grade Level 9-12**

**Computer-Generated Imagery & Animation**

**HIGH SCHOOL**

**Curriculum Guide**

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**LINDEN PUBLIC SCHOOLS**

**LINDEN, NEW JERSEY**

**MARNIE HAZELTON, ED. D**

**SUPERINTENDENT**

**DENISE CLEARY**

**ASSISTANT SUPERINTENDENT**

**RICHARD MOLINARO**

**DIRECTOR OF MATHEMATICS, VOCATIONAL AND TECHNICAL SUBJECTS**

**The Linden Board of Education adopted the Curriculum Guide on:**

|  |  |  |
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| **August 2020** |  | **Education - #10** |
| **Date** |  | **Agenda Item** |
|  | | |
| **Rationale**  **Be it resolved, that all curricula within the following content areas be readopted for use in the Linden Public Schools for the 2020-2021 school year. All curricula are aligned to the New Jersey Student Learning Standards.** | | |

**Public Notice of Non-Discrimination**

If any student or staff member feels that they have experienced discrimination on the basis of race, color, creed, religion, gender, ancestry, national origin, social or economic status, sexual orientation or disability, contact:

Affirmative Action Officer

Kevin Thurston – (908) 486-5432 ext. 8307; [kthurston@lindenps.org](mailto:kthurston@lindenps.org)

504 Officer & District Anti-Bullying Coordinator

Annabell Louis – (908) 486-2800 ext. 8025; [alouis@lindenps.org](mailto:alouis@lindenps.org)

Title IX Coordinator

Steven Viana – (908) 486-7085; [sviana@lindenps.org](mailto:sviana@lindenps.org)

Director of Special Education

Marie Stefanick – (908) 587-3285; [mstefanick@lindenps.org](mailto:mstefanick@lindenps.org)

**Linden Public Schools Vision**

The Linden Public School District is committed to developing respect for diversity, excellence in education, and a commitment to service, in order to promote global citizenship and ensure personal success for all students

**Linden Public Schools Mission**

The mission of the Linden Public School District is to promote distinction through the infinite resource that is Linden’s diversity, combined with our profound commitment to instructional excellence, so that each and every student achieves their maximum potential in an engaging, inspiring, and challenging learning environment.

**Computer Science Department Vision, Mission, and Philosophy**

WE BELIEVE THAT the New Jersey Core Curriculum Cross-Content Workplace Readiness Standards establish the framework for the Computer Science Curriculum. Furthermore, the Computer Science Curriculum supports, addresses, and utilizes elements of the Language Arts, Mathematics, and Science Standards. These standards enable learners to succeed in the workplace and in post-secondary educational programs.

* Cross-Content Workplace Readiness Standards
  + Career Planning
  + Critical Thinking skills
  + Decision-making skills
  + Problem-solving skills
  + Safety principles
  + Self-management skills
  + Use information
  + Use Technology
  + Workplace-readiness skills
* Language Arts and Standards
  + Listen actively
  + Read various materials
  + Speak formally and informally
  + Use non-textual visual information
  + Write clear, concise, organized language
* Mathematics Standards
  + Communicate effectively
  + Connect mathematics to other learning
  + Measurement
  + Number sense
  + Numerical operations
  + Numerical Operations
  + Reasoning Skills
  + State and solve mathematical problems
  + Use algebraic concepts to solve real-world problems
  + Use calculators and computers
  + Use concepts/methods of discrete mathematics
  + Use geometric properties/relationships to solve real-world problems
  + Use high levels of mathematical thought
* Science Standards
  + Formulate usable questions of hypothesis
  + Plan, experiment, investigation and research
  + Conduct systematic observations and collect data
  + Interpret and analyze data
  + Draw conclusions
  + Communicate results

**Course Description**

Introduction to basic knowledge, skills, abilities, processes, and tools required to create 3D computer animations. Hands-on lab activities allow students the ability to create their own 2D and 3D animations, as well as a digital portfolio to showcase their work. Computer-Generated Animation & Design follows a project-based format, with a focus on the creation of content for 3D animations, games, and simulations.

**Course Instructional Materials**

* Cinema 4D digital software
* Animation Starters Kit

**Standards and NJDOE Mandates Guiding Instruction**

* 1. New Jersey Student Learning Standards

<https://www.state.nj.us/education/cccs/>

Objectives align with the NJSLS Standard 8.2 Strand E. It incorporates concepts of

mathematical processes of problem solving in Mathematics and the content areas of

Technological Literacy and 21st Century Life and Careers.

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| **Content Area** | | **Technology** | | |
| **Standard** | | **8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**  **All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.** | | |
| **Strand** | | **E. Computational Thinking: Programming:** *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.* | | |
| **Grade**  **Level**  **bands** | **Content Statement**  **Students will be able to understand:** | | **Indicator** | **Indicator** |
| **9-12** | **Computational thinking and computer programming as tools used in design and engineering.** | | **8.2.12.E.1** | Demonstrate an understanding of the problem-solving capacity of computers in our world. |
| **8.2.12.E.2** | Analyze the relationships between internal and external computer components. |
| **8.2.12.E.3** | Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games). |
| **8.2.12.E.4** | Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements). |

**Interdisciplinary Connections and Materials**

* Language Arts: Literature and poetry relevant to the topics covered in each unit.
* Fine and Performing Arts: Visual art, plays, and movies relevant to the topics covered in each unit.
* Science & Technology: Scientific and technological advances made during or relevant to the topics covered in each unit.
* Math: Analysis and manipulation of statistics or other numeric information or data relevant to the topics covered in each unit.

**Units of Study**

* **Unit 1 –** Introduction to Cinema 4D
* **Unit 2 –** Essentials of Cinema 4D
* **Unit 3 –** Modeling and Animation
* **Unit 4 –** Realistic Animation

**Unit 1 – Introduction to Cinema 4D (7 weeks)**

**Essential Questions:**

* What is the purpose of spline modeling?
* How do advanced objects play a part in spline modeling?
* What is a spline?
* How does that translate to math? (Calculus) (Beizer Curves)
* What does (NURBS) stand for?
* How does weighing play a part in modeling?
* Describe the button shortcuts?
* How does the interface help you navigate the screen?
* What is Raytracing?
* What are the definitions of global and local illumination?
* What is the difference between biased vs. unbiased rendering?

**Key Performance and Benchmark Tasks:**

* + User Interface Basics
  + Spline modeling
  + Introducing of surface modeling
  + Polygon Modeling
  + Lighting and Rendering
  + Advanced Rendering
    - Assessment Topic #1: Learning the User Interface
    - Assessment Topic #2: Developing an Object in Cinema 4D

**Unit 2 - Essentials of Cinema 4D (5 Weeks)**

**Essential Questions:**

* How do basic shapes and complex shapes play a role with each other?
* How does splining play a role within complex shapes?
* What is basic principle of extruding?
* How does detail play apart into modeling?
* What advanced tools would play a part in modeling?
* How does splining connect with advanced detail?

**Key Performance and Benchmark Tasks:**

* + Modeling real-life objects
  + Advanced splining
  + Advanced Polygon Knowledge
  + Advanced Detail Rendering
    - Assessment Topic #1: Development of digital-rendered soda can using Cinema 4D

**Unit 3 – Modeling and Animation (6 Weeks)**

**Essential Questions:**

* How does texture play a part in animation?
* How does meshing with objects play a part in designing your objects?
* Why does advanced shaping play a huge role in designing?
* How does advanced framing play a part in developing your animation?
* How do you create the advanced effect?
* How do you create your multi-photos chips?
* How do you make multiple layer in animation?

**Key Performance and Benchmark Tasks:**

* + Digital drawing
  + Styles of Framing
* Modeling complex objects
* Show lighting and Rendering
* Detailing in a photographs
  + - Assessment Topic #1: Model and animate a potato chip bag using Cinema 4D

**Unit 4 – Realistic Animation (6 Weeks)**

**Essential Questions:**

* Why is the addition of light to an object important?
* Why is the addition of texture in a photograph important?
* What are ways to demonstrate detail in the animation process?

**Key Performance and Benchmark Tasks:**

* Introduction to animation concepts
* Animation of objects on basic level
* Using the stretching animation technique
* Using Nulls
* Using Deformers
  + Advanced Framing
  + Special Effects
  + After Effects
  + Reality vs. Simplicity
    - Assessment Topic #1: Creating of television commercial
    - Assessment Topic #2: Final amination project utilizing all skills learned throughout scope of course

**Accommodations, Modifications, and Teacher Strategies**

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| --- | --- | --- | --- |
| **Instructional Strategies**   * Teacher Presentation * Student Presentation * Class Discussion * Socratic Discussion * Reading for Meaning * Inquiry Design Model * Interactive Lecture * Interactive Notetaking * Compare and Contrast * Research Based * Problem Based * Project Based   **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work   Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits occupational or physical therapy | **Gifted and Talent Accommodations and Modifications**   * Allow for further independent research on topics of interest related to the unit of study * Advanced leveled readers and sources * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas | **Special Education and At-Risk Accommodations and Modifications**   * Focus on concept not details * More visual prompts * Leveled readers and teacher annotated sources * Timelines and graphic organizers * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate | **English Language Learners Accommodations and Modifications**   * Focus on concept not details * More visual prompts * Leveled readers and teacher annotated sources * Guided notes with highlighted words and concepts * Use of Merriam-Webster’s ELL dictionary * Timelines and graphic organizers * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate |

**Additional Resources**

* Tools for Thoughtful Assessment