

# Advanced Computer Engineering Graphics and Design

1 weighted credit 5 days/week

## Course Syllabus

Instructor: Mr. Alesi

Advanced Computer Engineering Graphics and Design is a year-long sequel to Computer Graphics 1 and Computer Engineering Graphics 2, and is a weighted academic course. Participants will research problems and employ the creative problem solving process. Throughout the course you will use various tools and machines, along with computer modeling and animation software and digital media, to arrive at solutions. Throughout your experience, we will continue to make connections to various fields of study including, but not limited to: Architectural Engineering, Mechanical Engineering, Industrial Design, Landscape Architecture, Web Design, Animation, Video Game Design, Video Production, Computer Science, and Graphics Design. Final projects will be presented using an online web portfolio developed in Wix.com. Students should be prepared to do work of an advanced nature, which challenges abilities gained in earlier classes. Along with some projects, a physical model may be necessary in order to complete the design prototype.

Colleges and post-secondary fields will be explored, as you look ahead to utilizing the skills from your Computer Engineering Graphics class experiences.

### Course content and activities:

This course is project oriented, with many on-going projects entailing lengthy details of an advanced nature. It will be necessary to manage time and be diligent at working toward completion deadlines.

#### Projects:

- 1. STEM Poster Image – Photoshop – 1 week (100 pts.)**
  - Collaborate with others on design concepts
  - Use research to put together an image rich design that tells the story of Advanced Computer Engineering Graphics
  - Print large format images with clarity
- 2. STEM Group Project Development – Solar Boat – AutoCAD, SketchUp, 3D Studio, Makerware/Cura – 3 weeks (200pts.)**
  - Work as a team toward a common goal (**Group Project**)
  - Utilize design skills with tolerance accuracy
  - Interact with technology resources, and traditional tools (laser cutter, and 3D printers, drill, scroll saw, etc)
  - Work with various materials and develop a working prototype that fits the design specifications
- 3. Advanced Modeling and UV Texturing – 3D model of a P47 Airplane – 3D Studio, Photoshop – 3 weeks (200 pts.)**
  - Low polygon modeling
  - Observing and following Geometric design constraints
  - Refine and edit using Smooth modifiers
  - Texturing with UV maps
  - Developing a final image combining 2D and 3D graphics as a virtual scene
- 4. SketchUp Modeling for conceptual models and visualization – 1½ weeks (100 pts.)**
  - Learn modeling and design techniques to produce parts for 3D printing.
  - work with common file types needed to interact with the 3D printing process.
  - Understand tolerance and dimensioning standards.
  - Develop surface to surface and part to part interactivity.
  - Build complex objects using simple geometric construction.
  - Add basic materials for visual effect
  - Create animated scenes to give a walkthrough impression

#### **Quiz – SketchUP geometric modeling processes and terms (50 pts.)**

- 5. Special Effects – After Effects, Photoshop, Illustrator, Premiere – “Spooktacular” – 1 week (50 pts.)**
  - Utilizing Photoshop layers in a composition
  - Effects and Blend modes

- Motion paths
  - Adjustment layers
  - Creating compositions and Pre-compositions
  - Use of layered effects
  - Procedural effects (editable throughout a project from start to end)
6. Special Effects – **After Effects, Photoshop, Premiere, Audition** – “**Holiday Snow Globe**” – 1 week (150 pts.)
- Utilizing Photoshop layers in a composition
  - Effects and Blend modes
  - Motion paths
  - Adjustment layers
  - Creating compositions and Pre-compositions
  - Use of layered effects
  - Procedural effects (editable throughout a project from start to end)
7. CAD Drawing - **Holiday House** – **AutoCAD, Illustrator, Photoshop** – 3 weeks (200 pts.)
- Vector graphics vs. raster graphics
  - Controlling machines with software (CNC)
  - Prototype development and the design cycle
  - Team interaction (**Group Project**)
  - Adherence to tolerance
8. Video Game Development – “**Break Out**” – **Unity3D, Photoshop** – 2 weeks (200 pts.)
- Programming in C# (Basic physics model interaction)
  - Working in coordinate systems (world, local)
  - Model interaction controlled by laws of physics
  - Creating Textures
  - Building a “Real World” functional game for a specific platform
9. Reverse Engineering – **Lego Model Design** - **AutoCAD, 3D Studio** - 3 weeks (200 pts.)
- Vector graphics vs. raster graphics
  - Controlling machines with software (CNC)
  - Prototype development and the design cycle
  - Team interaction
  - Adherence to tolerance
10. Video Game Design – “**Lerpz Escapes**” - **Unity3D, Photoshop, 3D Studio** – 3 ½ week (200 pts.)
- Programming in Java (Basic physics model interaction)
  - Creating an interactive menu
  - Developing a complete game level
  - Developing cut scenes between levels
  - Modding an existing game
  - Adding sound effects
  - Creating textures
  - Working in coordinate systems (world, local)
  - Model interaction controlled by laws of physics
  - Creating Textures
  - Building a “Real World” functional game for a specific platform
  - Team building skills (**Group Project**)
11. Video Game Design – “**Custom Game Design**” - **Unity3D, Photoshop, 3D Studio** – 2 ½ week (150 pts.)
- Programming in Java or C# (Basic physics model interaction)
  - Creating an interactive menu
  - Developing a complete game level
  - Developing cut scenes between levels
  - Modding an existing game
  - Adding sound effects
  - Creating textures
  - Working in coordinate systems (world, local)

- Model interaction controlled by laws of physics
- Creating Textures
- Building a “Real World” functional game for a specific platform
- Team building skills (**Group Project**)

**12. Invention Product, Research and Design Project** – All software available - 2 weeks (200 pts.)

- Draft, model, and construct for testing
- **(Group work)**
- Selection of needed software for a specific design need
- Video /photo documentation
- Final results posted to the web

**13. Architectural Green Design** (small structure), and Alternative Energy - 2 weeks (200 pts.) Modeling in real space

- Peer review of design concepts
- **( Group work)**
- Video /photo documentation
- Home Energy Audit
- “Going Green” Concepts presented based on PSU “Morning Star” home

**14. Holographic Image – After Effects, Premiere, Audition** – 1 week (150 pts.)

- Utilizing Photoshop layers in a composition
- Effects and Blend modes
- Motion paths
- Adjustment layers
- Creating compositions and Pre-compositions
- Use of layered effects
- Procedural effects (editable throughout a project from start to end)

**15. Technology Innovations Presentations** – You are responsible to find a new technology that may shape or dramatically impact our future. It may be in any field, but must be far enough along in development that it may be produced, not just a concept. Ideas can come from Kickstarter, news organizations, or other technology trending sites. 1<sup>st</sup> nine weeks you will present using your wix site. 2<sup>nd</sup> and 3<sup>rd</sup>, nine weeks submitted with more details, via email web link, 4<sup>th</sup> nine weeks present with full portfolio.

**Each nine weeks - (1<sup>st</sup> - 50 pts., 2<sup>nd</sup> - 75pts, 3<sup>rd</sup> - 100pts, 4<sup>th</sup> 100 pts.) – 1 Week**

- Give a reason why you found it interesting and the impact it will make
- Will it be made, based on your opinion
- Be able to provide a potential price
- List a web site if available
- Include a video if available, or good quality pictures which illustrate concepts of the technology
- Limit videos to 1 ½ minutes, presentation to 4 minutes.
- Include as a separate page of your Wix portfolio

**16. Wix Portfolio Development** – 3 weeks throughout the year including presentations (5 days to present)

- Online web sharing
- Connect to social media sites
- Show work to potential post-secondary schools for admission, scholarships or grants
- Personal ability to update and maintain

Independent Projects play a role in everything we do. You may have a specific interest or talent that allows you to showcase skills in related areas or projects that you have completed during extra class time, or outside of the school environment. Include those works to showcase your interests and abilities and to set you apart from all other students.

Concepts:

- Time management
- Skill development
- Research, design, and fun

- ❖ All projects will involve some level of refresher on specific software applications and processes. Most projects will require the use of several software packages to complete, with several smaller projects built into the process. Quizzes will be given on an as needed basis.
- ❖ At the end of each semester, each student will present work completed for peer review.
- ❖ Class participation and attendance will account for *50pts. per marking period*

**Relevant Class Resources:**

Mr. Troy Alesi [taa11@scasd.org](mailto:taa11@scasd.org)  
[www.scasd.org/teched/troyalesi](http://www.scasd.org/teched/troyalesi)  
<http://www.scasd.org/teched/podcasts>  
[www.students.autodesk.com](http://www.students.autodesk.com) (for free software, 3 year license)  
[www.color.adobe.com](http://www.color.adobe.com)  
[www.adobe.com](http://www.adobe.com)  
[www.autodesk.com](http://www.autodesk.com)  
[www.Thingiverse.com](http://www.Thingiverse.com)

**30 day trials can be downloaded for all of the Adobe programs. You could time these downloads with our units.**General Classroom Guidelines and Notes:

- Grades are posted in Home Access.
  - Unit completion dates are flexible. Updates to class schedule will be posted on the teacher web page calendar.
1. No Cell phone or media device use in class, other than in class computers.
  2. No food in the classroom.
  3. Drinks are permitted (in a container with a lid)
  4. You may use the in class printers for printing school related papers (before or after class, Color LaserJet 150).  
From a Google Doc, use the option to **Print from my computer**.
  5. No hats in the classroom.
  6. No games played on in class computers (except free day Fridays, once a month)
  7. No software loaded on in class computers (unless teacher directed and approved).