For the most current schedule, new supplies (materials) for the virtual environment and general class information, please login to your Blackboard course for updates posted by your professor.

# Syllabus

Spring 2020


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**Meeting Times:** Tuesday / Thursday

08:00 AM - 10:30 AM

SCAD®

The University for Creative Careers®

*School of Digital Media, Department of Visual Effects, Savannah*

## VSFX 755 - Procedural 3-D and Shader Programming
Section: 01 CRN: 31340

**SCAD Mission:**

SCAD prepares talented students for creative professions through engaged teaching and learning in a positively oriented university environment.

**Course Description:**

This course is an in-depth study of programming techniques used to develop the artistic vision of a 3-D environment. Industry-standard shader language is used to create rendering effects for the production of still images and animations using the most prevalent software in the industry. Prerequisite(s): VSFX 705.

**Course Goals:** The following course goals articulate the general objectives and purpose of this course:

1. Students will clearly understand the distinction between tool users and tool makers and more specifically to appreciate the role that software development plays in reshaping the digital tools used in sophisticated production studios.

**Student Learning Outcomes:** The following course outcomes indicate competencies and measurable skills that students develop as a result of completing this course:

1. Students will demonstrate familiarity with Pixar's shading language and the design of a variety of shader types.
2. Students will demonstrate familiarity with Houdini's VEX shading language.
3. Students will demonstrate familiarity with simple anti-aliasing techniques.
4. Students will demonstrate familiarity with writing Pixar's SLIM shading nodes.
5. Students will demonstrate familiarity with using mTOR to integrate a custom shader with Maya.

## Schedule of Classes:

Key events including assignments, projects due dates/exam dates:

| | |
|---|---|
| **Pre-quarter assignment** | Install required softare<br><br>Maya (Personal Learning Edition is OK)<br>Windows Visual Studio Community (VSC) Cutter and VSC<br>OSX XCode<br>Linux (pre-installed)<br>Java Runtime Environment (JRE)<br>Cutter text editor<br>RenderManForMaya and RenderManProServer (RfM & RPS)<br>Arnold Software Development Kit (SDK) Cutter and the Arnold SDK |
| **Unit 1:** | Topics<br>• plagiarism<br>• establishing a common directory structure<br>• intro to the 'C' programming language<br>• what are procedural primitives and how they are used<br>• compiling and linking using Cutter and Linux<br>• datatypes and libraries |
| **Unit 1:** | **Review** the student self images on their portfolio index web pages.<br>RfM Topics<br>• declaring pointer variables<br>• dereferencing pointer variables<br>• declaring and allocating memory for structures |
| **Unit 2:** | Topics:<br>• basic code of a procedural primitive<br>• procedural primitive - hello sphere!<br>• creating many spheres |

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| Unit 2: | Topics<br><br>• using the RiPoints gprim to create a cloud of particles<br>• using RiReadArchive to import pre-made assets<br>• assigning primvars<br>• using the PxrPrimVar node in HyperShade |
| Unit 3: | **Students present** their debris procedural primitive technical breakdowns.<br><br>Topic Arnold Shader Writing<br><br>• revision of the 'C' language topics covered so far<br>• basic concepts of the Arnold shader API<br>• basic implement a custom Arnold shader node<br>• using Cutter to generate an Arnold .cpp file<br>• basic documentation "Creating a Shader"<br>• https://docs.arnoldrenderer.com/display/AFMUG/Creating+a+shader#CreatingaShader-1.1.1InstallingaC++Compiler |
| Unit 3: | Topics - Configuring the Cutter + Maya + Arnold SDK Environment<br><br>• http://fundza.com/cutter/arnold_shaders/index.html<br>• how to load and use an Arnold custom shader in Maya<br>• how to add parameters to a shader. |
| Unit 4: | Topics - Coloring a surface by height<br><br>• http://fundza.com/arnold_shaders/color_by_height/index.html<br>• 3D textures and user coordinate spaces |
| Unit 4: | Topics - Creating patterns based on 'u' and 'v' texture coordinates :<br><br>• http://fundza.com/arnold_shaders/polygon/index.html |
| Unit 5: | Topics - Creating a side-mask shader:<br><br>• accessing surface normals and viewing vectors<br>• using the dot product operator |
| Unit 5: | Topics:<br><br>• developing 3D pattern plugins |
| Unit 6: | **Students present** their Arnold C/C++ pattern node technical breakdowns.<br>Topics<br><br>• Cutter & the Open Shading Language<br>• using Cutter to test an OSL shader |

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| **Unit 6:** | Topics:<br>• shading using 's' and 't' with PxrConstant<br>• shading using surface orientation with PxrConstant |
| **Unit 7:** | Topics<br>• shading using surface curvature with PxrConstant<br>• using custom attributes |
| **Unit 7:** | Topics:<br>• OSL development for Arnold - .osl and .mtd files<br>• limitations of Arnold OSL development<br>• applying strict naming conventions |
| **Unit 8:** | **Student presentation and review** of the technical breakdowns of the moom shading assignment.<br>Topics:<br>• writing Arnold "material" nodes |
| **Unit 8:** | Topics:<br>• continue developing Arnold "material" nodes |
| **Unit 9:** | Students will work on their personal Arnold OSL utility or material node. |
| **Unit 9:** | **Students present** their personal Arnold shading technical breakdowns. |
| **Unit 10:** | |
| **Unit 10:** | |

## Grading Opportunities:

Your overall course grade will be computed according to the following breakdown:

| Assignment | Weight |
|---|---|
| C++: RenderMan Debris Procedural Primitive | 25% |
| C++: Arnold Pattern Shader | 25% |
| OSL: Arnold MOOM (Many Objects One Material) Shading | 25% |
| OSL: Personal Arnold Pattern or Utility Shader | 25% |
| | |
| **Total Weight** | **100 percent** |

| Grading Standards | Range |
|---|---|
| Letter grade: **A** = excellent | 90 —100 percent |
| Letter grade: **B** = good | 80 — 89 percent |
| Letter grade: **C** = * | 70 — 79 percent |
| Letter grade: **D** = * | 60 — 69 percent |
| Letter grade: **F** = failing | 0 — 59 percent |

*Refer to the student handbooks and departmental standards for minimal acceptance for passing grade.

## Course Information:

**Field Trip(s):**

- **Women Make Movies: Women's History Month Virtual Film Festival 2020**
  - https://www.wmm.com/womens-history-month-virtual-film-festival-2020-sign-up/?utm_source=wmm&utm_medium=blog&utm_campaign=whm-virtual-film-fest
  - **Cost: Free Access to Select Films with sign-up**
- **The Tribeca Film Festival is offering free daily short film screenings.**
  - **New short films roll out every day at 11AM**
  - https://www.tribecafilm.com/
  - https://tinyurl.com/tribshorts
- **Ann Arbor Film Festival March 24-29 "Pushing boundaries"**
  - https://www.clickondetroit.com/all-about-ann-arbor/2020/03/18/ann-arbor-film-festival-to-offer-free-festival-films-film-events-online/
- **BFI Flare Film Festival - dedicated to LGBTIQ+ cinema**

- https://www.bfi.org.uk/bfi-flare-home

- International Documentary Festival Amsterdam
  - https://www.idfa.nl/en/collection/documentaries?page=8&filters[tvPrice]=Free
  - Cost: Free Access to Select Films from 2019 Lineup

Extra Help Session(s):

Friday 10 April 08am
Friday 24 April 08am

Extended Learning Opportunities:

VISION - A VSFX Virtual Lecture Series

- "Lighting for Stylized Animation"
  - Dave Walvoord VFX Supervisor at DreamWorks Animation
  - Tuesday, April 7, 2020 at 8pm EST
  - RSVP at https://forms.gle/pvhuoiH5wPxq2cTy7
- "To Fit In, or Stand Out? That is the question for YOUR Personal Brand."
  - Cat Gulacsy, Talent Manager at Calling All Talent, LLC
  - Thursday, April 16, 2020 at 8pm EST
  - RSVP at https://forms.gle/pvhuoiH5wPxq2cTy7
- "Navigating your Network in NYC"
  - Cat Gulacsy, Talent Manager at Calling All Talent, LLC
  - Thursday, April 30, 2020 at 8pm EST
  - RSVP at https://forms.gle/pvhuoiH5wPxq2cTy7
- "Lighting for Games" – Alumni Spotlight
  - Kevin Johnson (BFA VSFX 2018) Digital Lighter at High Moon Studios, San Diego CA
  - Haley Jones (BFA VSFX 2019) Lighter at Naughty Dog, Santa Monica CA
  - Saturday May 16th at 3:00pm EST
  - RSVP at https://forms.gle/pvhuoiH5wPxq2cTy7
- "VFX: Starting Out" – Alumni Spotlight
  - Alexis "Lexi" Cabone (BFA VSFX 2018) Character Effects Artist at MPC, Montreal
  - Jessica Love (BFA VSFX 2018) Digital Lighter at Mr. X., Montreal
  - Thursday May 7th, 2020 at 8pm EST

RSVP at https://forms.gle/pvhuoiH5wPxq2cTy7

**Other Course Information**

Review the "Selected Works" from the Spring quarter 2019.
https://sdm.scad.edu/faculty/mkesson/vsfx755/wip/best/spring2019/index.html

## Course Materials:

**Required Text(s):**

Computer Graphics through Key Mathematics

Huw Jones

Springer

ISBN 13:9781852334222

**Recommended Text(s):**

Python Scripting for Maya Artists (on-line)
Chad Vernon
http://www.chadvernon.com/blog/resources/python-scripting-for-maya-artists/

**Required Material(s):**

A notebook and pen.

## University Policies:

**Academic Integrity:**
Under all circumstances, students are expected to be honest in their dealings with faculty, administrative staff and other students.

In class assignments, students must submit work that fairly and accurately reflects their level of accomplishment. Any work that is not a product of the student's own efforts is considered dishonest. Students must not engage in academic dishonesty; doing so can have serious consequences.

Academic dishonesty includes, but is not limited to, the following:
1. Cheating, which includes, but is not limited to, (a) the giving or receiving of any unauthorized assistance in producing assignments or taking quizzes, tests or examinations; (b) dependence on the aid of sources including technology beyond those authorized by the instructor in writing papers, preparing reports, solving problems or carrying out other assignments; (c) the acquisition, without permission, of tests or other academic material belonging to a member of the university faculty or staff; or (d) the use of unauthorized assistance in the preparation of works of art.
2. Plagiarism, which includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. Plagiarism also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.
3. Submission of the same work in two or more classes without prior written approval of the professors of the classes involved.
4. Submission of any work not actually produced by the student submitting the work without full and clear written acknowledgement of the actual author or creator of the work.

**Attendance and Personal Conduct:**
Only students who are properly registered for a course may attend and participate in that class. Students are expected to attend and participate in all scheduled classes and examination periods. Absences in excess of four class periods per quarter,

or 20 percent of the course, result in the student receiving a failing grade for the course. Tardiness, early departure or other time away from class in excess of 15 minutes per class session is considered absence for the class session.

The student's appearance and conduct should be appropriate and should contribute to the academic and professional atmosphere of SCAD. The university reserves the right at its sole discretion to withdraw the privilege of enrollment from any student whose conduct is detrimental to the academic environment or to the well-being of other students, faculty or staff members, or to the university facilities.

**Enrollment policies:**
Students are responsible for assuring proper enrollment. See the SCAD catalog for information on add/drop, withdrawals, incompletes, and academic standing.

**Midterm Conference(s):**
Each student enrolled in the course will have a midterm conference scheduled outside of class time with the professor. Students are expected to keep this appointment.

**Academic Support and Tutoring:**
Academic support for students at all SCAD locations can be found in MySCAD, under the Student Workspace tab, Department Directory, Academic Resources.

**Course Evaluations:**
SCAD offers students the opportunity to evaluate all scheduled courses during each quarter term. Student feedback is essential to continuously improve academic services at SCAD. Evaluations will be available the end of each quarter at the beginning of Week 8 and must be completed online by the end of Week 10. A sample course evaluation for on-ground courses is available here.
In order to access course evaluations, the student should take the following steps:

1. Log on to MySCAD
2. Click on the Student Workspace Tab
3. Locate the Course Evaluations link under My Courses channel
4. This will bring up a page that says current surveys and lists all the courses that are currently available for evaluation.

For more information or questions, contact us at evaluations@scad.edu.

**Student Surveys:**
Students are strongly encouraged to provide feedback on their university experience through SCAD's institutional surveys. The SCAD Student Survey and the Noel-Levitz Student Satisfaction Inventory will both be administered in spring quarter. SCAD Student Survey will be emailed to every student's email account starting in Week 1. The Noel-Levitz Student Satisfaction Inventory will be administered on paper during Week 4 of spring quarter. SCAD's office of institutional effectiveness is responsible for gathering and delivering survey results to decision-makers on campus. For more information or questions, contact us at surveys@scad.edu.