Syllabus

Spring 2021

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Meeting Times: Tuesday / Thursday

2:00 PM - 4:30 PM

SCAD

The University for Creative Careers®

School of Digital Media, Department of Visual Effects, Savannah

VSFX 755 - Procedural 3D and Shader Programming
Section: 01 CRN: 31252

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 3D 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 Maya ([Personal Learning Edition](#) is OK) [Windows Visual Studio Community (VSC)](#) [Cutter and VSC](#) [OSX XCode](#) Linux (pre-installed) [Java Runtime Environment (JRE)](#) [Cutter text editor](#) [RenderManForMaya and RenderManProServer (RfM & RPS)](#) [Arnold Software Development Kit (SDK)](#) [Cutter and the Arnold SDK](#)
Class 1: **Tue, March 23, 2021**	Topics • intro to the 'C' programming language • compiling and linking a program using Cutter on Linux & OSX • compiling and linking a program using Cutter on Windows • [BASICS_C_DEMO.c](#) • [how a constants handled](#) (#define, const and enum)
Class 2: **Thu, March 25, 2021**	**Review** the student self images on their portfolio index web pages. • printing values - program output (printf() and C++ std::out) • [BASICS_CPP_DEMO.cpp](#) • datatypes, variables and visualizing their use in memory • variables, their values and their memory address • access a variables data via it's address in memory • [MEMORY_CPP_DEMO.cpp](#) • declaring pointer variables • dereferencing pointer variables • [structure and procedures](#)? • [declaring and allocating memory](#) for structures

Class 3: **Tue, March 30, 2021**	Topics: • revision of the 'C' language topics covered so far • [basic concepts of the C/C++ programming language](#) • [Cutter and Arnold public development](#) • using [example shaders](#) • [Arnold documentation "Creating a Shader"](#)
Class 4: **Thu, April 01, 2021**	Topics • development of a simple (red_left) shader
Class 5: **Tue, April 06, 2021**	**Review** the technical breakdowns of the red_left shader. Topic Arnold Shader Writing • implementing front/back shading • implementing color ramps using the mix() and smoothstep() functions
Class 6: **Thu, April 08, 2021**	Topics • continue the implementation of the side_mask shader • [anatomy of a side-mask pattern node](#) • developing the side_mask technical breakdown
Class 7: **Tue, April 13, 2021**	**Review** the technical breakdowns of the side_mask shader. Topics • applying color according to distance • 3D shading effects and user coordinate spaces
Class 8: **Thu, April 15, 2021**	Topics • implementing a height2color shader
Class 9: **Tue, April 20, 2021**	**Review** the technical breakdowns of the height2color shader. Topics • [Cutter & the Open Shading Language](#) • using Cutter to test an OSL shader • the Arnold OSL workflow

Class 10: **Thu, April 22,** **2021**	Topics: • developing an OSL version of the C++ height2color shader • [Ai User Data Float Tutorial](#)
Class 11: **Tue, April 27,** **2021**	**Students present** their Arnold C/C++ pattern node technical breakdowns. Topics • focusing on Arnold shader development • [Ai User Data Float Tutorial](#)
Class 12: **Thu, April 29,** **2021**	Topics: • shading using 's' and 't' (RenderMan) and 'u' and 'v' (Arnold) • shading using surface orientation both RenderMan and Arnold
Class 13: **Tue, May 04,** **2021**	Topics • using custom primvars (RenderMan) • using custom attributes (RenderMan and Arnold)
Class 14: **Thu, May 06,** **2021**	Topics: • development of the moom shader (many objects, one material)
Class 15: **Tue, May 11,** **2021**	**Student presentation and review** of the technical breakdowns of the moom shading assignment. Topics: • OSL development for Arnold - .osl and .mtd files • limitations of Arnold OSL development • applying strict naming conventions • converting a RenderMan OSL pattern node to an Arnold utility node
Class 16: **Thu, May 13,** **2021**	Topics: • continue developing Arnold "material" nodes
Class 17: **Tue, May 18,** **2021**	Students will work on their personal Arnold OSL utility or material node.
Class 18: **Thu, May 20,** **2021**	Students will work on their personal Arnold OSL utility or material node.
Class 19: **Tue, May 25,** **2021**	Students will work on their personal Arnold OSL utility or material node.

Class 20: Thu, May 27, 2021	**Students present** their personal Arnold shading technical breakdowns.

Grading Opportunities:

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

Assignment	Weight
[C++: Arnold red_left shader](#)	20%
[C++: Arnold side_mask shader](#)	20%
[C++: Arnold height2color shader](#)	20%
[OSL: Arnold moom shading](#)	20%
[OSL: personal arnold shading node](#)	20%
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):

Savannah

3/26/21
4:00pm - 6:00pm
Introduction To Unreal Engine
Charles Shami   https://scad.zoom.us/meeting/register/tJAqfuGspjkpG9LSanAt1vZLWN7lUki8Vnka
Montgomery Hall room 111
Students will be introduced to the fundamentals of the Unreal Game Engine user interface,
the settings, and game engine components. Students will be more familiar with the Unreal
Engine workflow.

Savannah
4/2/21
10:00am - 12:00pm
Career Development: Professionalism Dos and Don'ts   Adriana
https://scad.zoom.us/meeting/register/tJwkce2tqjgtH9RPgIMlE30UaTcS5uiHNiWB
In this workshop , students will learn tips and advice regarding professionalism- from dos
and don'ts in interviews- to techniques on how to prepare. Give a good first impression and
stay calm in an interview.

Atlanta
4/9/21   10:00am - 12:00pm
Eyetrace for Still and Moving Images
Quinn Orear   https://scad.zoom.us/meeting/register/tJAod--hpzwqHtRQju8cZq5kZIfRFHRFPoH3
Join Professor Orear for a cross-disciplinary presentation on how to anticipate and
manipulate where our viewer or audience's eyes will go when presented with our images.

Extra Help Session(s):

Friday 10 April 08am
Friday 24 April 08am

University-wide extended learning opportunities

Extended learning opportunities are designed to enrich and expand students' course-based learning
experiences. Attend at least three (3) of the following 10 university-wide extended learning opportunities (i.e.,
Guests & Gusto, Bee Well, SCADextra and SCADamp workshops, or SCAD signature events) either on-ground
or virtually to further explore your discipline, discover new information, and deepen academic engagement.

Please refer to the grading opportunities section of this syllabus to see how your participation in the above
extended learning opportunities and your completion of related assignments contribute to your overall grade
for this course.

Additional extended learning opportunities:

Savannah
4/16/21   10:00am - 12:00pm
Monster Madness! Character Design Workshop
Brian Bowes   https://scad.zoom.us/meeting/register/tJErdeCtqj8iGN36toihwAqK0JeR9Gk_Vupt
Students will have the opportunity to develop a unique creature character with Professor
Bowes. We will discuss the design process, design considerations and development. In
this hour long workshop we'll work through thumbnails, research and development, and
tight pencil sketches.

Atlanta
4/30/21   1:00pm - 3:00pm
Defining the Human Figure through Shadow Shapes
Thomas Dang Vu   https://scad.zoom.us/meeting/register/tJEpcroom
567cmgpjMuGtMIt9HYng4z4mUMHkLICGyb
Learn about life drawing and how to focus on seeing shape rather than detail through
personalized instruction. Applicable for students in all majors - especially for
students majoring in fine arts, animation and sequential arts.
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Savannah - Equestrian Center
5/7/21   1:00pm - 3:00pm
Joe Regan   https://scad.zoom.us/meeting/register/tJItdumrqT4vH9CaqK7MUsXRy2Apsq8RmeKu
Observational Drawing: Drawing Animals
Spend an afternoon with the horses at the SCAD Equestrian Center! Students will learn
the classic art of drawing animals from observation and how to get accurate representation
with an animal in motion.
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Atlanta   VIRTUAL
5/14/21   4:00pm - 6:00pm
Introduction to Color Theory
Stephen Thorpe   https://scad.zoom.us/meeting/register/tJAkc-GprzkpGNH9NcrFKsr6gTU2TnnKPaeV
Introduction to the weird and wonderful world of color. We shall examine and explore how color
is always influencing our thoughts, our decisions, our moods and how color and our eyes
constantly deceive us.

Savannah - Gulfstream room 139b
5/21/21   1:00pm - 3:00pm
Sung Park   https://scad.zoom.us/meeting/register/tJwtcu6qpzssE9M0F9fNLgNVKZeyRdOX8Trv
Designing for Artificial Intelligence
A hands-on workshop for designing and prototyping AI including vision recognition and
VUX(Voice User Experience). Demonstration with voice interactive devices(Amazon Echo,
Google Home) and a short lecture on how to design and then hands-on prototyping by students.

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):

[Software Engineering in C | Peter A. Darnell | Springer](#)

- ISBN 978-1-4684-0308-4
- available second-hand

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 Policy:
Students are expected to actively engage in courses to achieve the required learning outcomes. Absences in excess of 20 percent of the course (e.g., five absences for a 10-week course that meets twice per week) result in the student receiving a failing grade, unless the student withdraws from the course in accordance with the [withdrawal policy](#). Absences due to late registration are included in the overall absences permitted for the course.

For on-ground courses, students are expected to attend and participate in all scheduled class periods. Tardiness, early departure, or other time away from class in excess of 15 minutes per class session is considered an absence for that class session.

Students enrolled in eLearning courses are required to check the online course site regularly and academically engage in the daily work of the course. At minimum, students should log in to the course and participate in academically related activities on two separate days per unit/week.

For students enrolled in real-time virtual courses (i.e., SCADnow), active participation in live lectures is the most beneficial form of academic engagement and the best way to demonstrate attendance. If students are unable to attend live lectures due to time zone or other individual challenges, they should demonstrate academic engagement and attendance by logging in to the course and participating in academically related activities on at least two separate days per unit/week.

SCAD faculty monitor and measure attendance for eLearning and SCADnow by documenting each student's weekly academic engagement. Academic engagement is defined as participating in live lectures, demos, or critiques; posting to discussion forums or blogs; submitting assignments; completing quizzes or examinations; attending extra help sessions, office hours, or midterm conferences; and/or corresponding with professors regarding course content via phone, email, text, etc.

Personal Conduct Policy:
Students' appearance and conduct should be appropriate and contribute to the academic and professional atmosphere of SCAD. Any student whose conduct is detrimental to the academic environment or to the well-being of other students, faculty, staff members, or university facilities will be subject to disciplinary action, up to and including expulsion from the university.

Enrollment policies:
Students are responsible for assuring proper enrollment. See scad.edu 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:
Course evaluations offer students a dedicated opportunity to provide constructive feedback on each of their courses. Student feedback gathered through course evaluations is essential to continuously improving the SCAD academic experience. Evaluations are available to students each quarter during Weeks 8, 9, and 10 through MySCAD. For additional information, contact evaluations@scad.edu.

Student Surveys:
SCAD strongly encourages students to provide feedback on their university experience through institutional surveys. The SCAD Student Survey and the Ruffalo Noel Levitz Student Satisfaction Inventory are administered to students across locations each spring. The National Survey of Student Engagement is administered biennially in winter. Following survey administration, SCAD's institutional effectiveness department analyzes and reports results to various SCAD departments to inform data-driven enhancements. For additional information, contact surveys@scad.edu.