



El Camino College
COURSE OUTLINE OF RECORD – Official

Subject:	DART
Course Number:	231
Descriptive Title:	3D Procedural Modeling, Simulation & FX
Division:	Fine Arts
Department:	Digital Art and Design Technology
Course Disciplines:	Digital Art and Design Technology
Catalog Description:	In this course, students continue building their modeling skills with high quality procedurally generated and simulated geometry and effects using the latest procedural modeling techniques and software for film, TV, visual effects (VFX), and games. Specific processes and software to produce procedurally generated geometry and simulated visual effects like water, smoke, and fire will take students' 3D models and renderings to the level of professional asset development. Advanced compositing techniques will help students build a computer graphics (CG) reel that is ready to launch them into a career as a fully rounded 3D modeler.
Prerequisite:	DART 104
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	2
Hours Laboratory (per week):	3
Outside Study Hours:	4
Total Course Hours:	90
Course Units:	3
Grading Method:	Letter Grade and Pass/No Pass
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	
Transfer UC:	Yes
Effective Date:	
General Education ECC:	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	

Term:	
Other:	
Student Learning Outcomes:	<p>Upon completion of this course students will be able to:</p> <ol style="list-style-type: none"> 1. create environment models using procedural work-flows to automate placement and randomization of elements. 2. employ procedural simulation techniques to model organic surfaces and materials such as water, cloth, grass, moss, stone, etc. 3. utilize particle systems and related techniques to create fog, dust, fire, spark, or other applicable visual effects.
Course Objectives:	<ol style="list-style-type: none"> 1. Use simulation techniques to create high quality visual effects for smoke, fire, and other particle based effects 2. Use simulation and displacement techniques to create high quality visual effects for water, realistic glass, and other transparent effects 3. Use simulation techniques to create short animated sequences of moving water, smoke, and other visual effects 4. Use procedural modeling techniques to generate landscape features, plant life, grass, buildings, man-made scenery elements and other details 5. Use procedural modeling techniques to place plant life, man-made details, buildings and other details into an environment 6. Leverage instancing of objects to reduce the overall size and computational weight of a complex scene 7. Develop shaders to bring detail, color, texture, and materials to procedurally generated scenes 8. Render high quality stills and fly-through animations of procedurally modelled scenes with water, smoke and other particle effects for a professional clip reel
Major Topics:	<p>Lecture Topics:</p> <ol style="list-style-type: none"> I. Procedural Geometry <ol style="list-style-type: none"> A. User Interface (UI) and Tools B. Primitives C. Attributes D. Editing E. Copying and instancing F. Displacement mapping/height fields G. Node based procedural geometry workflows H. Geometry nodes II. Particle systems <ol style="list-style-type: none"> A. Node based particle systems workflows B. Instancing on particles C. Dynamics, forces, and movement D. Particle life cycles E. Optimization of particle systems III. Procedural Simulation <ol style="list-style-type: none"> A. UI and Tools B. Simulation setup C. Cloth, smoke, water, fire, and other simulated systems D. Node based simulation workflows E. Dynamics nodes IV. Environment Modeling with Procedural Geometry <ol style="list-style-type: none"> A. Procedural geometry for environments B. Dynamic variation of instances and elements V. Asset finalization and export <ol style="list-style-type: none"> A. Export file types and data

	<ul style="list-style-type: none"> B. Export workflows for games, animation, and vfx <p>VI. Compositing and Rendering</p> <ul style="list-style-type: none"> A. Node based compositing workflows B. Shader nodes C. Render passes D. Render output <p>VII. Basic scripting for procedural geometry and simulation</p> <ul style="list-style-type: none"> A. MEL B. Python <p>VIII. Analysis and Critique</p> <ul style="list-style-type: none"> A. Foundation for critique of character, prop, and vehicle modeling work B. Visual communication of character, prop, and vehicle modeling work <p>IX. Project Planning and Execution</p> <p>Lab Topics:</p> <ul style="list-style-type: none"> I. 3D procedural modeling exercises <ul style="list-style-type: none"> A. Environment creation B. Node network creation C. Organic objects with procedural geometry II. Procedural simulation exercises <ul style="list-style-type: none"> A. Water B. Cloth C. Smoke D. Fire III. Particle systems exercises <ul style="list-style-type: none"> A. Particle systems examples B. FX examples IV. Compositing and Rendering exercises <ul style="list-style-type: none"> A. Procedural shaders B. Scene compositing V. Project Planning and Execution <ul style="list-style-type: none"> A. final project planning B. final project execution VI. Presentation, Analysis, and Critique <ul style="list-style-type: none"> A. Presentation of modeling work
Total Lecture Hours:	36
Total Laboratory Hours:	54
Total Hours:	90
Primary Method of Evaluation:	3) Skills demonstration
Typical Assignment Using Primary Method of Evaluation:	Use procedural modeling techniques to add details to a 3D environment. Determine the most relevant details, locate suitable geometry and then determine a suitable node structure to distribute the geometry in the scene. Make sure the distribution appears natural to the context of the scene and adjust the node structure accordingly based on peer feedback.
Critical Thinking Assignment 1:	Analyze a peer's shader node structure for efficiency and aesthetic appeal of its output material. Provide feedback on how to improve the efficiency of the shader at render time. Also provide feedback on how to improve the aesthetic quality of the output wherever possible. Point out the tradeoffs between efficiency and visual quality and when those tradeoffs favor one over the other and why.

Critical Thinking Assignment 2:	Assess the polycount of a procedurally generated scene and identify strategies for making the scene more efficient for rendering animation. Make specific recommendations for reducing polycounts when possible and where instances may be employed to reduce overall project size on disk.
Other Evaluation Methods:	Completion, Presentation
If Other:	
Instructional Methods:	Demonstration, Discussion, Guest Speakers, Lab, Lecture, Multimedia presentations
If other:	
Work Outside of Class:	Skill practice
If Other:	
Up-To-Date Representative Texts:	Williams, Richard. The Animators Survival Kit--Revised Edition: A Manual Of Methods, Principles And Formulas For Classical, Computer, Games, Stop Motion And Internet Animators, ed. New York: Faber & Faber Publishing, 2012. (Discipline Standard)
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite	Prerequisite
Category	sequential
Requisite course:	DART 104
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	Basic Understanding of 3D modeling DART 104 - Explore fundamentals of 3d objects and space such as scale, proportion, geometry, topology. Understanding of production pipeline and 3D modeling process DART 104 - Examine production pipelines and responsibility of each department, including the steps, skills, and processes within each pipeline stage.
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill(s). if applicable	
Requisite course:	
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Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Arnold Martin
Date:	09/02/2024
Original Board Approval Date:	01/13/2025
Effective Term:	FA 2025