



El Camino College
COURSE OUTLINE OF RECORD – Official

Course Acronym:	DART
Course Number:	131
Descriptive Title:	3D Characters & Props
Division:	Fine Arts
Department:	Digital Art and Design Technology
Course Disciplines:	Digital Art and Design Technology
Catalog Description:	<p>In this course, students will build on the foundations of Digital Modeling tools and principles to create highly detailed characters and props. Students will learn to refine traditional polygonal modeling process and learn new processes for character models including blocking out forms, low poly modeling, ultraviolet (UV) mapping, and detailed multiresolution sculpting. Students will also learn and apply advanced topology for anatomical forms and retopology with normal maps to retain visual detail while reducing polycount for animation workflows. Students will learn to incorporate blend shapes to create three-dimensional (3D) facial expressions and advanced material and shaders and lighting to bring your characters, props, and scenes to life and create portfolio and reel ready work.</p>
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 or Pass/Fail
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	fall 1997
Transfer UC:	Yes
Effective Date:	fall 1997
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. analyze character and prop concepts and develop 3D meshes with good quad topology suitable for 3D animation. 2. leverage digital sculpting processes and advanced shaders to create high detail, high-poly, meshes for characters and prop assets. 3. apply retopology and remesh techniques to hi-poly meshes with advanced shaders, and baked normal maps from sculpted geometry to create meshes suitable for animation.
Course Objectives:	<ol style="list-style-type: none"> 1. design and model original characters, props, and vehicles using traditional polygonal modeling techniques with good quad topology suitable for animation 2. design and model original characters, props, and vehicles using digital kit-bash, massing, remeshing, and sculpting techniques 3. use retopology techniques on a digitally sculpted characters, props and vehicles to reduce poly count and make the model suitable for animation 4. use baked normal maps to restore detail from a high poly sculpt to a lower poly remeshed/retopologized model 5. develop advanced material shaders to bring texture and detail to digital models suitable for animation 6. test animation suitability of character meshes with basic FK rigging and mesh deforms 7. render still images and turntable animations of characters, props, and vehicles for addition to a professional clip reel
Major Topics:	<p>Lecture Topics:</p> <ol style="list-style-type: none"> I. 3D topology for character modeling <ol style="list-style-type: none"> A. Quad modeling B. Edge and face loops C. Optimization for editing and computation D. Sub-Division surface modeling II. Traditional polygonal and curves modeling <ol style="list-style-type: none"> A. Primitive geometry review B. Modeling processes (e.g. extrusion, spinning, sweeping, poly building) C. Modeling with curves D. Patch modeling (nubs surfaces) E. Poly count and editability III. 3D scanning and retopology <ol style="list-style-type: none"> A. Scanning existing objects B. Retopology tools and processes IV. 3D kit-bash techniques <ol style="list-style-type: none"> A. Finding model resources B. Adding detail with found models C. Arrays, repetition, and texture with 3D geometry V. 3D sculpting process and techniques <ol style="list-style-type: none"> A. Massing B. Remeshing C. 3D Sculpting tools, processes, and techniques D. Subdivision levels E. Sculpting brush creation and customization VI. Baking Normal Maps <ol style="list-style-type: none"> A. UV editing for normal maps

	<ul style="list-style-type: none"> B. Normal map creation C. Remesh and retopology of high-poly models D. Applying normal maps to restore detail to low-poly remesh/retopology <p>VII. Basic rigging and binding for animation tests</p> <ul style="list-style-type: none"> A. FK joint hierarchy B. Binding techniques C. Refining deforms with weight painting D. Animation tests <p>VIII. Advanced material shaders</p> <ul style="list-style-type: none"> A. UV mapping B. Adaptive mapping C. Shader types and specular highlights D. Alpha materials E. Displacement maps F. MEL/Python integration <p>IX. 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>X. Project Planning and Execution</p> <p>Lab Topics:</p> <ul style="list-style-type: none"> I. 3D modeling exercises <ul style="list-style-type: none"> A. Polygonal modeling and topology for characters, props, and vehicles B. 3D scanning and remeshing techniques C. 3D digital sculpting techniques D. Remeshing techniques E. Retopology workflows for characters F. Advanced material shader workflows G. Baking normal maps from high poly sculpts H. UV editing for high-definition normal maps I. Animation tests for character models II. Project Planning and Execution <ul style="list-style-type: none"> A. Final project planning B. Final project execution III. 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:	<p>Design and model a 3D bi-pedal character from image references using concept design sheets with orthographic turns. Use the design sheets to create a 3D model using the following process:</p> <ul style="list-style-type: none"> • blockout with primitives • low resolution mesh model • UV mapping • subdivision and multiresolution sculpting • baked normal maps

	<ul style="list-style-type: none"> • medium poly retopology for final mesh • final materials, lighting, and rendered turntable animation <p>Render the various stages of the process for your final portfolio and clip reel. Apply material and texture shaders to the final mesh and render a turntable animation for your final clip reel.</p> <p>Projects will be evaluated on effective execution of each phase of the process and the overall quality of the final model as it relates to re-imagining and represent the original 2D character design.</p>
Critical Thinking Assignment 1:	<p>Retopology analysis and process: Starting with a 3D scan of human face, and reference photos of the subject's facial expressions identify key features and movements of the subject's face. Use the key features to create edge and face loops that follow the features to develop good quad topology that avoids excessive poles, n-gons. Create a retopology model of the original scan based on the original analysis. Use basic sculpting techniques to make a series of facial expressions from the original reference to apply as blend shapes to the final retopology mesh. Assignment work will be evaluated on the quality of the final topology, its suitability for animation, and the likeness to the original model and facial expression references.</p>
Critical Thinking Assignment 2:	<p>UV Mapping: Starting with a provided character mesh with good topology analyze and identify logical seams in the mesh so it can be UV unwrapped efficiently. Use the resulting UV map to create shaders that add color, texture, and visual detail to the original model. Assignment work will be evaluated on the effective use of the UV mapping process to make an understandable layout of islands in the UV map and the quality of the final shaders as it relates to the character mesh.</p>
Other Evaluation Methods:	Class Performance, Completion, Multiple Choice, Quizzes, True/False
Instructional Methods:	Demonstration, Discussion, Group Activities, Lab, Lecture, Multimedia presentations
If other:	critiques, and (where possible) attendance at Art exhibitions.
Work Outside of Class:	Problem solving activity, Required reading, Skill practice, Study
If Other:	
Up-To-Date Representative Texts:	<p>AUTODESK Maya 2025, 2025 edition, Autodesk, 2024, https://help.autodesk.com/view/MAYAUL/2025/ENU/, CC-BY-NC-SA 3.0 Unported.</p> <p>Blender 4.2 Manual, 4.2 (LTS) edition, Blender Foundation, 2024, https://docs.blender.org/manual/en/latest/, CC-BY-NC-SA 4.0 int.</p>
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	Computer and studio tools
Requisite:	Prerequisite
Category:	sequential
Requisite course(s): List both prerequisites and corequisites in this box.	DART 104
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	<p>Basic Understanding of 3D modeling DART 104 - Explore fundamentals of 3d objects and space such as scale, proportion, geometry, topology.</p> <p>Understanding of production pipeline and 3D modeling process</p>

	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:	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
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Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Donald G. Hudson
Date:	09/25/1990
Original Board Approval Date:	04/08/1991
Last Reviewed and/or Revised by:	Arnold Martin
Date:	03/10/2024
Last Board Approval Date:	01/13/2025
Effective Term:	FA 2025