Course Acronym:	DART
Course Number:	140
Descriptive Title:	3D Character Animation & Rigging
Division:	Fine Art
Department:	Digital Art and Design Technology
Course Disciplines:	Digital Art & Design Technology
Catalog Description:	In this course, students learn the foundation of animation in 3D using pre-built rigged assets to focus on key poses, timing, expression, exaggeration, and weight to create compelling movement cycles in various styles and sequences with 3D assets. Students will explore body mechanics to create convincing movement with 3D rigged character assets, and then push it beyond reality to make exaggerated movements come to life. Students learn the process of posing for facial expression, dialog, lip syncing from key poses to 3D animatics and polished movement sequences. Students will render out their animation work to build their professional reel.
Prerequisite:	DART 104
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	2
Hours Laboratory (per week):	4
Outside Study Hours:	4
Total Course Hours:	108
Course Units:	3
Grading Method:	Letter Grade and Pass/No Pass
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	fall 1998
Transfer UC:	Yes
Effective Date:	fall 1998
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	

Term:	
Other:	

Student Learning Outcomes:	Upon completion of this course students will be able to: 1. use keyed properties, graph editing, and animation layers to develop motion sequences with rigged 3d character and creature geometry 2. express weight, drama, suspense, emotional expression, action or other cinematic elements, in 3d animated sequences with key poses, in-betweens poses, and breakdowns 3. animate action sequences that use both realistic body mechanics and exaggerated, cartoony mechanics
Course Objectives:	1. apply principles of animation to 3D character motion, facial expression, and acting for 3D character animation 2. explore body mechanics to create motion sequences using pre-rigged 3d geometry that recreate athletic movement, dance, and other extreme but naturalistic human movement 3. push body mechanics beyond reality to create exaggerated motion sequences using pre-rigged 3d geometry 4. animate motion sequences for non-bipedal creatures using pre-rigged 3d geometry both realistic and cartoony in movement 5. use keyed properties, graph editing, and animation layers to create major movements and secondary movements for believable motion sequences with pre-rigged 3d geometry 6. apply rigging techniques, forward and inverse kinematics, weight painting, and other techniques to develop custom armatures or rigs for 3D characters 7. animate custom designed rigged assets in 3D 8. render high quality animatics from animated motion sequences for addition to a professional clip reel

Major Topics:	**Lecture Topics:**
	I. **Animation Principles for 3D Character Animation**
	    A. Timing, weight, follow through, squash and stretch
	    B. VFX vs cartoon style animation principles
	    C. Reference, reference, reference!
	II. **Animation Methods for 3D Character Animation**
	    A. Pose to pose
	    B. Straight ahead
	    C. Animation layers
	    D. Easing, arcs, secondary motion
	III. **Biomechanics and anatomy for 3D animation**
	    A. Skeletal joints and anatomy terms
	    B. Musculature and body types
	    C. Facial expression and mechanics
	    D. Quadruped body mechanics
	    E. Realistic movement based on realistic mechanics
	    F. Exaggerated or cartoon movement pushing beyond realistic mechanics
	IV. **Movement Sequences**
	    A. Linear vs. non-linear animation techniques
	    B. Athletic movement animation
	    C. Non-biped animation
	    D. Exaggeration of realistic move**ent for animation**
	V. **Facial Expression and Acing for 3D Animation**
	    A. Facial expressions
	    B. Mouth, eye, and tongue shapes for pronunciation

VI. **Animation Tools and Process**
   - A. Keyed properties and graph editing
   - B. Path constraints and other drivers
   - C. Animation Layers
   - D. Forward and Inverse kinematic techniques
   - E. Looping movements
   - F. Motion capture data and cleanup
   - G. Posing
   - H. Clips and Loops

VII. **Rigging Tools and Process**
   - A. Functional design for custom rigs
   - B. Joint and kinetic hierarchy
   - C. Constraints and hierarchies
   - D. Binding/Skinning techniques and options
   - E. Weight painting
   - F. IK controls
   - G. Handles and control shapes
   - H. Rigging characters with props

VIII. **Analysis and Critique**
   - A. Foundation for critique of character animation work
   - B. Visual communication of character designs

IX. **Project Planning and Execution**

Lab Topics:

I. **3D Character Animation Exercises**
   - A. Finding and using motion reference
   - B. Animating motion sequences
   - C. Animating facial expressions
   - D. Animating on paths and with drivers
   - E. Acting and pushing reality in 3D animation
   - F. Non-biped animation
   - G. Application of animation principles in 3D character animation
   - H. Animating characters with props

II. **3D Rigging Exercises**
   - A. Creation of a custom 3D character rig
   - B. Animation of a custom 3D character rig

III. **Project Planning and Execution**
   - A. Final project planning
   - B. Final project execution

IV. **Presentation, Analysis, and Critique**
   - A. Presentation of animation work

Total Lecture Hours:	36
Total Laboratory Hours:	72
Total Hours:	108
Primary Method of Evaluation:	3) Skills demonstration
Typical Assignment Using Primary Method of Evaluation:	Using an existing character with rig and reference clip, recreate the action in the reference clip using animation layers and keyed properties of the armature. Start with key poses to time the action and then add breakdowns as needed. Use a mix of forward and inverse kinematic controls depending on the needs of each frame. Present the final animation with the original reference clip in a weekly review session.

Critical Thinking Assignment 1:	Analyze the hierarchy of movement for a quadrupedal animal and create a 3D armature for the mesh that typifies the movement of the original reference. Apply the armature to a test mesh and determine the best method for binding the skin to armature so the model may be animated without visual defects.
Critical Thinking Assignment 2:	Analyze the animation layers and keyframes in a peer's 3D animated motion sequence. Considering the motion in the scene look for places where the keyed data can be simplified. Also make suggestions about where the motion can be refined and how best to make those changes considering the structure of the keys and layers. Provide the feedback in writing in the course LMS and verbally in class.
Other Evaluation Methods:	Class Performance, Completion, Homework Problems, Multiple Choice, Quizzes, True/False
Instructional Methods:	Demonstration, Discussion, Group Activities, Lab, Lecture, Multimedia presentations
If other:	
Work Outside of Class:	Problem solving activity, Required reading, Skill practice, Study
If Other:	
Up-To-Date Representative Texts:	Cheryl Briggs, An Essential Introduction to Maya Character Rigging, 2nd Edition, CRC Press, 2021 AUTODESK Maya 2025, 2025 edition, Autodesk, 2024, https://help.autodesk.com/view/MAYAUL/2025/ENU/, CC-BY-NC-SA 3.0 Unported.
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite:	Prerequisite
Category:	sequential
Requisite course(s): List both prerequisites and corequisites in this box.	DART 103
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Understanding of principles of animation and animnation production pipeline** DART 103 - Examine the production pipeline and responsibility of each department, including the steps, skills, and processes within each pipeline stage. DART 103 - Develop and bring concepts to life through iterative processes (i.e., mock-ups, prototypes, performance, etc.) DART 103 - Research current industry-standard tools and practices used across art, media, and entertainment industries.
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).	
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Joyce Dallal
Date:	10/25/2017
Original Board Approval Date:	
Last Reviewed and/or Revised by:	Arnold Martin
Date:	09/02/2024
Last Board Approval Date:	01/13/2025
Effective Term:	FA 2025