

**ARCH 52A Course Outline as of Fall 2024****CATALOG INFORMATION**

Dept and Nbr: ARCH 52A Title: DIGITAL MODELS 1

Full Title: Digital Models and Graphics 1

Last Reviewed: 5/13/2024

| Units   | Course Hours per Week |                   | Nbr of Weeks |      | Course Hours Total |       |
|---------|-----------------------|-------------------|--------------|------|--------------------|-------|
| Maximum | 3.00                  | Lecture Scheduled | 2.00         | 17.5 | Lecture Scheduled  | 35.00 |
| Minimum | 3.00                  | Lab Scheduled     | 3.00         | 8    | Lab Scheduled      | 52.50 |
|         |                       | Contact DHR       | 0            |      | Contact DHR        | 0     |
|         |                       | Contact Total     | 5.00         |      | Contact Total      | 87.50 |
|         |                       | Non-contact DHR   | 0            |      | Non-contact DHR    | 0     |

Total Out of Class Hours: 70.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: ARCH 26A

**Catalog Description:**

Students will learn and utilize the computer modeling application, Rhinoceros 3D, for the creation of digital models and two-dimensional (2D) graphics generated from those models. Emphasis will be on the creation of three-dimensional (3D) forms and surfaces through the manipulation of 2D shapes, platonic primitives, and Boolean interaction of forms. Graphical images derived from student-created models will include orthographic views, parallel and perspective views, and images rendered with materials and lighting.

**Prerequisites/Corequisites:****Recommended Preparation:**

Eligibility for ENGL 100 or EMLS 100 (formerly ESL 100)

**Limits on Enrollment:****Schedule of Classes Information:**

Description: Students will learn and utilize the computer modeling application, Rhinoceros 3D, for the creation of digital models and two-dimensional (2D) graphics generated from those models. Emphasis will be on the creation of three-dimensional (3D) forms and surfaces through

the manipulation of 2D shapes, platonic primitives, and Boolean interaction of forms. Graphical images derived from student-created models will include orthographic views, parallel and perspective views, and images rendered with materials and lighting. (Grade or P/NP)

Prerequisites/Corequisites:

Recommended: Eligibility for ENGL 100 or EMLS 100 (formerly ESL 100)

Limits on Enrollment:

Transfer Credit: CSU;

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

|                   |                      |            |           |
|-------------------|----------------------|------------|-----------|
| <b>AS Degree:</b> | <b>Area</b>          | Effective: | Inactive: |
| <b>CSU GE:</b>    | <b>Transfer Area</b> | Effective: | Inactive: |

|               |                      |            |           |
|---------------|----------------------|------------|-----------|
| <b>IGETC:</b> | <b>Transfer Area</b> | Effective: | Inactive: |
|---------------|----------------------|------------|-----------|

|                      |              |            |           |           |
|----------------------|--------------|------------|-----------|-----------|
| <b>CSU Transfer:</b> | Transferable | Effective: | Fall 2024 | Inactive: |
|----------------------|--------------|------------|-----------|-----------|

|                     |  |            |  |           |
|---------------------|--|------------|--|-----------|
| <b>UC Transfer:</b> |  | Effective: |  | Inactive: |
|---------------------|--|------------|--|-----------|

**CID:**

**Certificate/Major Applicable:**

Not Certificate/Major Applicable

## **COURSE CONTENT**

### **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Use Rhinoceros 3D software modeling application to create 3D forms from surfaces and objects.
2. Depict objects in various standard views including elevation, plan, section, axonometric, isometric, and perspective views.
3. Create graphic renderings of objects by controlling and depicting light, shade, shadows, textures, and materials.

### **Objectives:**

At the conclusion of this course, the student should be able to:

1. Create sculpted forms of additive and subtractive elements in a software application.
2. Apply materials to created objects.
3. Illuminate objects with various forms of lighting elements and conditions.
4. Create and export isometric, axonometric, parallel projection, and perspective views of objects.
5. Create and export rendered views of objects.
6. Create and export orthographic views of objects including plans, elevations, and sectional views.

### **Topics and Scope:**

#### **I. Use of Digital Models in Professional Practice**

- A. Building Information Modelling (BIM) overview

- B. Animations
    - 1. Solar studies
    - 2. Walk-throughs
    - 3. Phasing
  - C. Forensics and historical reconstructions
  - D. Presentation renderings and other visualizations
  - E. Extended Reality (XR) applications
  - F. File formats and file exchange compatibility
  - G. Importing Rhinoceros 3D created files in other computer applications
- II. Best Practices for Modeling
- A. Template options
  - B. File naming
  - C. Maintaining accuracy
    - 1. Objects snaps
    - 2. Ortho
    - 3. Grid snap
    - 4. Manual dimensional input
    - 5. Manual directional input
  - D. File backups
  - E. Saves, Saveas, and Autosave
  - F. Object selection methods
  - G. Maximizing object view
  - H. Command prompt and command history use
  - I. Non-uniform rational basis splines (NURBS) objects compared to polygonal meshes
- III. Rhinoceros 3D Launch Interface - Start/About Screen
- A. New document from templates
  - B. Recent, Open, and License tabs
  - C. News, Tips and Getting Started Tutorials
- IV. Rhinoceros 3D Editor Interface
- A. Title bar and options
  - B. Menus
    - 1. File
    - 2. Edit
    - 3. View
    - 4. Curve
    - 5. Surface
    - 6. SubD
    - 7. Solid
    - 8. Mesh
    - 9. Dimension
    - 10. Transform
    - 11. Tools
    - 12. Analyze
    - 13. Render
    - 14. Panels
    - 15. Help
      - a. Submenus
      - b. Text-based alternative to tabbed toolbars
  - C. Command Area and history
  - D. Tabbed toolbars
    - 1. Standard
    - 2. CPlanes

3. Set View
  4. Display
  5. Select
  6. Viewport Layout
  7. Visibility
  8. Transform
  9. Curve Tools
  10. Surface Tools
  11. SubD Tools
  12. Mesh Tools
  13. Render Tools
  14. Drafting
  15. New in V7
    - a. Tool button functionality options
    - b. Mouse-over tips
- E. Side toolbar
1. Docking and undocking
  2. Contextual tools based on tabbed toolbars
  3. Standard tabbed toolbar contextual tools
- F. Object snap controls
1. End
  2. Near
  3. Point
  4. Mid
  5. Cen
  6. Int
  7. Perp
  8. Tan
  9. Quad
  10. Knot
  11. Vertex
  12. Project
  13. Disable
- G. Status bar and use
1. CPlane setting
  2. X, Y, and Z coordinates display
  3. Units settings
  4. Layer setting
  5. Grid Snap, Ortho, Planar, Osnap, SmartTrack, Gumball, Record History, Filter, and
- Memory Use
- H. Viewports
1. Default configuration
    - a. Top
    - b. Front
    - c. Right
    - d. Perspective views
  2. Resizing viewports by mouse control
  3. Maximizing viewports
  4. Viewport tabs
  5. Creating additional viewports
  6. Viewport navigation with mouse buttons
  7. Controlling visual display styles by viewport control

8. Setting view direction by viewport control
9. Setting viewport layout by Viewport Layout tabbed toolbar

#### I. Panels

1. Properties
2. Layers
3. Rendering
4. Materials
5. Libraries
6. Help
7. Others

#### V. Curve Menu Objects

##### A. Open versus closed objects

##### B. Lines

1. Lines
2. Polylines

##### C. Curves

1. Circles
2. Ellipses
3. Curves
4. Arcs
5. Parabolas
6. Helix
7. Sketch

##### D. Polygons

1. Inscribed and circumscribed regular polygons
2. Closed polylines
3. Rectangles
4. Rounded rectangle
5. Stars

##### E. Editing tools

1. Split
2. Trim
3. Fillet
4. Chamfer
5. Offset
6. Tangent
7. Explode
8. Join

#### VI. Surface Menu Objects

##### A. Surfaces versus solids

##### B. Closed versus open surfaces

##### C. Object creation

1. Plane
2. Loft
3. Sweep
4. Rail
5. Rail revolve

##### D. Object creation

1. Curve Network
2. Corner Points
3. Edge Curve
4. Planar Curves

- 5. Point Grid
- E. Object creation
  - 1. Extrude Curve
  - 2. Patch
  - 3. Drape
  - 4. Heightfield from Image
- F. Modifiers
  - 1. Extend Surface
  - 2. Fillet Surface
  - 3. Chamfer Surfaces
  - 4. Connect Surfaces
  - 5. Variable Fillet/Blend/Chamfer
- VII. SubD Menu Objects
  - A. SubD forms
    - 1. From Object
    - 2. Primitives
  - B. SubD forms
    - 1. Loft
    - 2. Sweep 1 Rail
    - 3. Sweep 2 Rails
    - 4. Revolve
    - 5. Pipe
    - 6. MultiPipe
    - 7. Offset SubD
    - 8. Extrude Curve
  - C. SubD form modifiers
    - 1. Bridge
    - 2. Fill
    - 3. Append Face
    - 4. Insert Edge
    - 5. Insert Point
    - 6. Bevel
    - 7. Expand Edges
    - 8. Symmetry
  - D. SubD form tools
    - 1. Repair Tools
    - 2. Edit Tools
- VIII. Solid Menu Objects
  - A. Solid primitive forms
    - 1. Box
    - 2. Sphere
    - 3. Cylinder
    - 4. Cone
    - 5. Truncated Cone
    - 6. Pyramid
    - 7. Truncated Pyramid
  - B. Solid forms
    - 1. Ellipsoid
    - 2. Paraboloid
    - 3. Tube
    - 4. Pipe
    - 5. Slab

- 6. Torus
- C. Solid form: Text
- D. Form modifiers
  - 1. Extrude Planar Curve
  - 2. Extrude Surface
  - 3. Extrude Surface to Boundary
  - 4. Boss
  - 5. Rib
- E. Form modifiers
  - 1. Offset
  - 2. Fillet Edge
  - 3. Cap Planar Holes
  - 4. Extract Surface
- F. Boolean operations
  - 1. Union
  - 2. Difference
  - 3. Intersection
  - 4. Boolean Two Objects
  - 5. Boolean Split
  - 6. Create Solid
- G. Solid Edit Tools
- IX. Render Menu Tools
  - A. Rendered views
    - 1. Shade
    - 2. Render Preview
    - 3. Render
    - 4. Batch Render Named Views
  - B. Lighting objects
    - 1. Create Spotlight
    - 2. Create Point Light
    - 3. Create Directional Light
    - 4. Create Rectangular Light
    - 5. Create Linear Light
  - C. Lighting tools
    - 1. Edit Light by Looking
    - 2. Edit Light by Highlight
    - 3. Set Spotlight to View
    - 4. Set View to Spotlight
  - D. Open Last Rendering
  - E. Materials
    - 1. Material Editor
    - 2. Environment Editor
    - 3. Texture Editor
    - 4. Merge Identical Materials
  - F. Other tools
    - 1. Panels
    - 2. Effects
    - 3. Safe Frame Settings
    - 4. Current Renderer
    - 5. Render Properties
- X. Creating Images for Presentation Purposes
  - A. Screen captured views and rendered views

- B. Renderer alternatives
- C. Orthographic views
  - 1. Plans
  - 2. Elevations
  - 3. Sections
- D. Axonometric views
  - 1. Isometric
  - 2. Planometric
- E. Perspective views
  - 1. One-point
  - 2. Two-point
  - 3. Three-point perspectives
- F. Compositional techniques
  - 1. Regulating lines
  - 2. Positive/negative space
  - 3. Balance
  - 4. Rule-of-thirds
  - 5. Golden spiral

The above Topics and Scope apply to both lecture and lab course components in an integrated format.

**Assignment:**

Lecture-related Assignments:

- 1. Reading (15-20 pages per week)
- 2. Quiz(zes) (1-4)

Lab-related Assignments:

- 1. 3D modeling assignments (6-12)
- 2. Presentation images (6-12)
- 3. Computer modeling technique demonstration (1)

Lecture- and Lab-related Assignments:

- 1. Final exam and/or final project presentation

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because skill demonstrations are more appropriate for this course.

Writing  
0 - 0%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.



3D modeling assignments and presentation images

Problem solving  
60 - 80%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Computer modeling technique demonstration

Skill Demonstrations  
5 - 10%

**Exams:** All forms of formal testing, other than skill performance exams.

Quiz(zes), final exam and/or final project presentation

Exams  
10 - 20%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

Participation

Other Category  
0 - 10%

### **Representative Textbooks and Materials:**

Instructor prepared materials

Digital Media Series: Rhinoceros. Rhee, Jinmo and Man Kim, Eddy. Independently published. 2019. (classic).

Simplified Complexity. Di Marco, Giancarlo. Le Penseur. 2018. (classic).