ARCH 52B Course Outline as of Fall 2024

CATALOG INFORMATION

Dept and Nbr: ARCH 52B Title: DIGITAL MODELS 2
Full Title: Digital Models and Graphics 2
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 26B

Catalog Description:
Students will continue to learn and utilize the computer modeling application, Rhinoceros 3D, for the creation of complex digital models and two-dimensional (2D) and three-dimensional (3D) graphics generated from those models. Emphasis will be on the creation of complex 3D architectural form and surfaces through the manipulation of 2D shapes, platonic primitives, extrusions, sweeps, revolves, transformations, boolean interaction of forms, and the use of Grasshopper. Graphical images derived from student-created models will include orthographic views, parallel and perspective views, and images rendered with materials, lighting, and entourage. The use of the computer application Twinmotion will introduce students into game-engine rendering and Virtual Reality (VR) for visual immersion into digital models.

Prerequisites/Corequisites:
Course Completion of ARCH 26A (or ARCH 62A) and ARCH 52A

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:

Description: Students will continue to learn and utilize the computer modeling application, Rhinoceros 3D, for the creation of complex digital models and two-dimensional (2D) and three-dimensional (3D) graphics generated from those models. Emphasis will be on the creation of complex 3D architectural form and surfaces through the manipulation of 2D shapes, platonic primitives, extrusions, sweeps, revolves, transformations, boolean interaction of forms, and the use of Grasshopper. Graphical images derived from student-created models will include orthographic views, parallel and perspective views, and images rendered with materials, lighting, and entourage. The use of the computer application Twinmotion will introduce students into game-engine rendering and Virtual Reality (VR) for visual immersion into digital models. (Grade or P/NP)
Prerequisites/Corequisites: Course Completion of ARCH 26A (or ARCH 62A) and ARCH 52A
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
CSU GE:	**Transfer Area**			Effective:	Inactive:
IGETC:	**Transfer Area**			Effective:	Inactive:
CSU Transfer:	Transferable	Effective:	Fall 2024	Inactive:	
UC Transfer:		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 orthographic architectural images.
2. Create and export rendered perspective images with Rhinoceros 3D.
3. Create 3D physical models from 3D digital models.

Objectives:
At the conclusion of this course, the student should be able to:
1. Model an architectural building with Rhinoceros 3D.
2. Create floor plans, elevations, sections, and site plans of 3D architectural models.
3. Create one-point, two-point, and three-point perspective views of 3D architectural models.
4. Create parallel axonometric views of 3D architectural models, such as isometrics.
5. Use a 3D printer for printing an architectural model.
6. Prepare a 3D model for use with a laser cutter
7. Create images and video animations with Twinmotion.
8. Use virtual reality equipment for an immersive experience walk-through of an architectural model.

Topics and Scope:

I. Rhinoceros 3D Review
- A. Object types
  1. Points
  2. Curves
  3. Surfaces
  4. SubD
  5. Solids
  6. Meshes
- B. Object transforms
  1. Move
  2. Copy
  3. Array
  4. Rotate
  5. Scale
  6. Align
  7. Bend
  8. Twist
  9. Taper
  10. Stretch
  11. Flow Along Curve
  12. Flow Along Surface
- C. Object edits
  1. Trim
  2. Extend
  3. Symmetry
  4. Split
  5. Join
  6. Fillet
  7. Chamfer
  8. Blend
- D. Object modifiers
  1. Extrude
  2. Revolve
  3. Sweep
  4. Loft
- E. Object Booleans
  1. Union
  2. Difference
  3. Intersection
- F. Maintaining accuracy
  1. Object snaps
  2. Ortho
  3. Dimensions
  4. Measuring

II. Creation and Use of Architectural Model Elements
- A. Topography
- B. Walls
- C. Floors
- D. Ceilings

E. Roofs
F. Columns
G. Beams and framing members
H. Windows and doors
I. Landscaping
J. Entourage

III. Standard Architectural Drawing Graphical Elements

A. Site Plans
1. Property lines
2. Building footprint
3. Roof form
4. Landscaping
5. Pavement and site surfaces
6. Topographic contours
7. Shade and shadows
8. Title graphics
9. Informational graphics
a. Labels
b. North arrow
c. Graphical scale

B. Floor plans
1. Commonly used architectural scale factors
2. Standardized depiction of architectural elements
a. Walls
b. Windows and doors
c. Stairs
d. Casework
e. Plumbing fixtures
f. Landscaping
g. Entourage
3. Dimensions
4. Title graphics
5. Informational graphics
a. Room labels
b. North arrow
c. Graphical scale

C. Elevations
1. Hidden line view
2. Application of materials
3. Landscaping
4. Entourage
5. Sky
6. Glass surfaces
7. Shade and shadows
8. Title graphics

D. Sections
1. Figure/ground depiction
2. Room labels
3. Depiction of elements beyond section cut plane
4. Shade and shadows
5. Title graphics

E. Axonometric Views

1. Isometric
2. Planometric

F. Perspective Views
1. One-point perspectives
2. Two-point perspectives
3. Three-point perspectives

IV. Parametric Design
A. Generating design options by algorithms
B. Examples of generative design
1. The parametricism of Zaha Hadid
a. The Heydar Aliyev Centre
b. Antwerp Port Authority building
c. Tables
1. Vitra Mesa edition table
2. Le-a table
d. Shoes
1. United Nude NOVA shoe
2. Melissa shoe
e. Jewelry by Zaha Hadid
2. San Francisco Museum of Modern Art expansion designed by Snøhetta

V. Grasshopper with Rhinoceros 3D
A. Launching Grasshopper from Rhinoceros 3D
B. Grasshopper user interface
C. Use of the Grasshopper Canvas for visual programming
D. Establishing the Grasshopper to Rhinoceros 3D link
E. Testing and debugging code
F. Online resources for programming examples

VI. Twinmotion for use with Rhinoceros 3D
A. Twinmotion interface
B. Importing Rhinoceros 3D content
C. Adding assets
D. Controlling environment settings
E. Materials
F. Lighting
G. Camera and views
H. Exportation of media
I. VR use in Twinmotion

VII. Making 3D Models with Rhinoceros 3D
A. Stereolithographic (STL) files
B. G-code generation with slicing software
C. 3D printer preparation, materials, monitoring, and clean-up
D. Preparation of model file for laser cutting
E. Assembly of 3D models

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

Assignment:

Lecture-related Assignments:
1. Reading (15-30 page per week)
2. Quiz(zes) (1-2)

Lab-related Assignments:
1. Digital models (6-12)
2. Images from digital models (12-24)
3. Renderings from digital models (6-12)
4. 3D printed models (2-4)
5. 3D laser cut preparation(s) (0-2)

Lecture- and Lab-related Assignments:
1. Final exam and/or final project (1)

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 problem solving assessments 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.

Digital models and preparation(s), images, renderings, and 3D models	Problem solving 60 - 80%

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

None	Skill Demonstrations 0 - 0%

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

Quiz(zes), final exam and/or final project	Exams 10 - 20%

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

Participation and final project presentation	Other Category 10 - 20%

Representative Textbooks and Materials:
Instructor prepared materials
Digital Media Series: Rhinoceros. Rhee, Jinmo and Man Kim, Eddy. Independently published. 2019. (classic).
Digital Media Series: Grasshopper. Rhee, Jinmo and Man Kim, Eddy. Independently published. 2020.
AAD Algorithms-Aided Design: Parametric Strategies using Grasshopper. Tedeschi, Arturo. Le

Pensuer. 2014. (classic).
Simplified Complexity. Di Marco, Giancarlo. Le Penseur. 2018. (classic).