
SketchUp Syllabus: 3D Modeling and Visualization

Course Overview:
This course provides a comprehensive introduction to SketchUp, a powerful and intuitive 3D modeling software. Students will learn fundamental modeling techniques, workspace management, material application, and basic presentation skills, enabling them to create, edit, and visualize 3D models for various design purposes.
Learning Objectives:
Upon completion of this course, students will be able to:

- Navigate the SketchUp interface and customize their workspace.
- Utilize core drawing and editing tools to create precise 2D and 3D geometry.
- Understand and apply the concepts of groups and components for efficient model organization.
- Work with materials and textures to enhance model realism.
- Manage scenes and styles for effective presentation and animation.
- Import and export various file formats.
- (Optional, depending on course length) Utilize LayOut for 2D documentation and V-Ray for realistic rendering.

Prerequisites:

- Basic computer literacy.
- Familiarity with 2D drafting concepts (beneficial but not required).

Module 1: Introduction to SketchUp Fundamentals

- **1.1 Getting Started with SketchUp**
  - What is SketchUp? Applications and industries.
  - SketchUp versions (Pro, Free, for Schools) and their differences.
  - Understanding the SketchUp interface: Toolbars, trays, drawing area, status bar, Measurements box.
  - Setting up templates and units (Imperial vs. Metric).
  - Navigating the 3D environment: Orbit, Pan, Zoom.
  - Saving and opening models.
- **1.2 Basic Drawing Tools (2D Foundation)**
  - Line tool: Creating lines, understanding inferences (on axis, endpoint, midpoint).
  - Rectangle tool: Drawing rectangles and squares with precise dimensions.
  - Circle tool: Creating circles and polygons with segment control.
  - Arc tools (Arc, 2-point Arc, 3-point Arc, Pie): Drawing curved geometry.
  - Freehand tool.
  - Eraser tool: Deleting and softening edges.

- **1.3 Introduction to 3D Modeling (Push/Pull)**
  - Understanding surfaces and faces.
  - Push/Pull tool: Creating 3D forms from 2D faces.
  - Offset tool: Creating parallel lines and shapes.
  - Follow Me tool: Extruding profiles along paths.
  - Introduction to selecting objects and using modifier keys.

Module 2: Model Organization and Efficiency

- **2.1 Groups and Components**
  - Understanding "sticky geometry" and its implications.
  - Creating and editing groups.
  - Understanding components: Instances vs. unique components.
  - Benefits of using components (efficiency, dynamic components).
  - Using the 3D Warehouse: Importing and managing pre-made models.
  - Creating and saving your own components.
- **2.2 Outliner and Tags (Layers)**
  - The Outliner: Managing model hierarchy (groups, components).
  - Tags (formerly Layers): Controlling visibility and organizing model elements.
  - Best practices for model organization.
- **2.3 Transformation Tools**
  - Move tool: Moving objects, stretching geometry, creating copies and arrays.
  - Rotate tool: Rotating objects, creating radial arrays.
  - Scale tool: Resizing objects and models proportionally and non-proportionally.
  - Flip tool: Mirroring objects.

Module 3: Enhancing Visuals and Precision

- **3.1 Materials and Textures**
  - Applying materials from the default library.
  - Editing materials: Color, texture, opacity.
  - Creating custom materials from images.
  - Projecting textures on curved surfaces.
  - Understanding texture positioning and mapping.
- **3.2 Measuring and Annotation**
  - Tape Measure tool: Measuring distances and creating guide lines.
  - Protractor tool: Measuring angles and creating angle guides.
  - Dimension tool: Adding linear and angular dimensions.
  - Text tool: Adding 2D and 3D text labels.
  - Section Planes: Creating temporary cuts to view model interiors.
- **3.3 Styles and Scenes**
  - Applying pre-defined styles to change the visual appearance of your model.
  - Editing styles: Edge settings, face settings, background, watermarks.

    - Creating and managing scenes: Saving specific camera views, styles, and layer visibility.
    - Animating scenes for walkthroughs and presentations.

Module 4: Advanced Modeling and Integration (Optional/Intermediate Topics)

- **4.1 Terrain Modeling (Sandbox Tools)**
    - Creating terrain from contour lines.
    - Sculpting terrain with the Smoove tool.
    - Stamping and draping objects onto terrain.
    - Geo-location: Importing terrain and imagery from Google Maps.
- **4.2 Solid Tools (SketchUp Pro)**
    - Understanding solid groups and components.
    - Using Boolean operations: Union, Intersect, Subtract, Trim, Split, Outer Shell.
    - Practical applications for complex geometry.
- **4.3 Working with External Data**
    - Importing CAD files (DWG/DXF) as a basis for modeling.
    - Importing other 3D models (e.g., from other software).
    - Exporting 2D images (JPG, PNG, PDF).
    - Exporting 3D models (DWG, DXF, 3DS, OBJ, FBX).

Module 5: Presentation and Documentation (Optional/Advanced Topics)

- **5.1 Introduction to LayOut (SketchUp Pro)**
    - Understanding LayOut as a companion for 2D documentation.
    - Sending SketchUp models to LayOut.
    - Creating and managing drawing pages.
    - Setting up views and scales.
    - Adding dimensions, labels, and annotations in LayOut.
    - Creating title blocks and templates.
    - Exporting LayOut documents (PDF, images).
- **5.2 Basic Rendering (Introduction to V-Ray/Other Renderers)**
    - Concept of rendering in SketchUp.
    - Introduction to basic rendering settings (e.g., lighting, materials).
    - Setting up simple exterior and interior renders.
    - Exporting rendered images.

Project-Based Learning:

Throughout the course, practical projects will reinforce learned concepts. Examples include:

- Modeling a piece of furniture (e.g., a table, chair).
- Designing a small room or interior space (e.g., a bedroom, office).
- Creating a simple residential building with basic openings.

- Developing a small landscape design with terrain.

Assessment:

- Practical exercises and assignments.
- Mid-term project.
- Final project showcasing a comprehensive understanding of SketchUp tools and workflows.
