**Algorithm for 3D Cube Rotation**

**1. Cube Creation:**

* Define the cube's vertices in 3D space. Each vertex is represented by a 4D homogeneous coordinate (x, y, z, 1).
* Define the edges of the cube, where each edge connects two vertices.

**2. Translation Matrix:**

* Create a function translate matrix(tx, ty, tz) to generate a translation matrix that can shift the object by the specified distances tx, ty, and tz along the x, y, and z axes respectively.

**3. Rotation Matrices:**

* Implement separate functions to generate rotation matrices for rotating the object about the X, Y, and Z axes using the specified angle (in radians). These rotation matrices modify the position of the object based on the axis of rotation.

**4. Arbitrary Axis Rotation:**

* To rotate around an arbitrary axis, first define the rotation axis with two points (x1, y1, z1) and (x2, y2, z2).
* Normalize the vector along the axis of rotation.
* Translate the object so that the axis of rotation passes through the origin.
* Construct the rotation matrix using Rodrigues' rotation formula:

R=I+ sin (θ)⋅K+(1−cos(θ))⋅K2

* Where:
  + I is the identity matrix.
  + K is the skew-symmetric matrix of the unit vector along the axis of rotation.
* Apply the translation before and after the rotation to return the object to its original position.
* The composite rotation matrix is the product of these translation and rotation matrices.

**5. Transformation of Vertices:**

* To apply the rotation, multiply the cube's vertices by the transformation matrix (composite matrix from step 4). This transforms the 3D coordinates of each vertex.

**6. Plotting the Cube:**

* Use matplotlib to visualize the original and rotated cubes.
* Create a 3D scatter plot of the vertices and connect the vertices with edges using lines.
* Optionally, visualize the axis of rotation as a red dashed line.

**7. Displaying the Plot:**

* Use subplots to display the original and transformed cubes side by side.
* Set appropriate labels and titles for the axes and the plots.
* Adjust the aspect ratio to ensure the cube is proportionally displayed in all directions.