Course Title: **Data Modeling**
Course Number: **9400120**
Course Credit: **1**

Course Description:
In this course, students learn about the nature of data and various tools and techniques used in different industries to retrieve, render, and display 2-D and 3-D data. Students are provided instruction in the concepts and techniques associated with rendering dynamic or changing data as animation. They are also introduced to various imaging techniques used in different industries, their implications, applications, and challenges. The ultimate output of this course is a portfolio created by the student from a scenario related to the student's industry of interest. The portfolio should include a narrative description of the scenario, the approach to data collection, a description of the tools and techniques used for rendering, and an interpretation of each data model. Research references should be cited appropriately. Given the advanced nature of this course, consideration should be given to having students produce the portfolio using presentation software.

CTE Standards and Benchmarks	NGSSS-Sci
52.0 Describe 3D modeling. – The student will be able to:	SC.912.E.6.2
52.01 Define 3D modeling.	
52.02 Compare and contrast the solid and shell categories of 3D models.	
52.03 Describe the polygonal, NURBS, splines & patches, primitives, and sculpting methods of 3D modeling.	
52.04 Describe the constructive solid geometry method of 3D modeling and give examples of its value to data visualization.	
52.05 Describe the implicit surfaces (isosurfaces) method of 3D modeling and give examples of its value to data visualization.	
52.06 Describe the subdivision surfaces method of 3D modeling and give examples of its value to data visualization.	
52.07 Identify common 2D and 3D modeling tools.	
53.0 Apply basic 3D modeling concepts. – The student will be able to:	SC.912.P.10.19
53.01 Manipulate primitive modeling views by using the three Boolean operations (union, subtract, and intersect) to create 3D objects.	
53.02 Utilize revolve or extrude commands to create 3D objects from 2D shapes.	
53.03 Enhance a 3D object's realism by using the shading technique.	
53.04 Use 3D orbit to rotate objects for better visualization.	
53.05 Adjust the lighting of a 3D object to enhance the visualization.	
54.0 Render 3D objects to final form. – The student will be able to:	SC.912.P.10.19

CTE Standards and Benchmarks		NGSSS-Sci
54.01	Use texture mapping in rendering a 3D object.	
54.02	Use UV mapping in rendering visualizations.	
54.03	Use bump mapping in rendering visualizations.	
54.04	Use lighting in rendering a 3D visualization.	
55.0	Animate 3D objects using dynamic data. – The student will be able to:	
55.01	Assign values to points of a 3D object based on information from a database.	
55.02	Create a script and storyboard for the animation.	
55.03	Use a 3D modeling program to alter the dataset to create an animated 3D object.	
55.04	Vary the data if fixed ways to observe/analyze results.	
55.05	Integrate the animation scene into a slide presentation using an application such as PowerPoint.	
56.0	Render an animated 3D model. – The student will be able to:	SC.912.L.16.14, 17
56.01	Select a topic suitable for animation (e.g., lytic cycle of a T4 bacteriophage virus, a scientific concept or law, replication of a famous experiment, explain how something works, explain a disease) and conduct background research.	
56.02	Create a script and storyboard for the animation, including identifying needed data.	
56.03	Use a 3D modeling program to build the appropriate graphics and corresponding data to be used in the animation scenes.	
56.04	Create a data-driven, 3-4 second animation for each scene in the animation.	
56.05	Render each scene and export to an appropriate file format (e.g., AVI, MPEG, MP3, SWF).	
56.06	Integrate the animation scene into a slide presentation using an application such as PowerPoint.	
57.0	Interpret different types of spatial data used in 3D visualization and analysis. – The student will be able to:	
57.01	Explore methods of obtaining, downloading, and extracting free data using the Internet.	
57.02	Build 3D datasets.	
57.03	Display 2D features onto a 3D surface.	
57.04	Create shapefiles to view in a 3D environment.	

CTE Standards and Benchmarks		NGSSS-Sci
	57.05 Construct a 3D model of a physical environment.	
	57.06 Display georeferenced data measurements in 3D.	
	57.07 Apply Interpolation methods.	
	57.08 Utilize georeferenced 2D data in a 3D environment.	
	57.09 Create contour lines in a 3D environment.	
58.0	Customize the display of geospatial data. – The student will be able to:	SC.912.E.6.1; SC.912.N.1.1
	58.01 Edit Layer Properties.	
	58.02 Create Layer Files.	
	58.03 Edit an attribute table by adding a new field with calculating values.	
	58.04 Perform relates and joins with data tables.	
59.0	Manage, query, and symbolize geospatial data. – The student will be able to:	SC.912.E.6.5; SC.912.N.1.1
	59.01 Label features.	
	59.02 Insert, copy, and paste data into new data frames.	
	59.03 Create graphs and reports from data.	
60.0	Create, change, and manipulate remotely sensed image data. – The student will be able to:	SC.912.P.12.2
	60.01 View single band and multispectral images.	
	60.02 Perform various manipulations to an image including creating a subset of an image, mosaic two georeferenced images, and orthorectification.	
	60.03 Perform image analysis by orthorectifying non-georeferenced digital images to existing map features.	
	60.04 Enhance an image by adjusting the brightness and contrast, adjusting the histogram, applying custom histogram stretches, sharpening and smoothing its appearance.	
	60.05 Convert an image from color IR to natural color by performing a resolution merge.	
61.0	Construct a 3D model of a physical environment. – The student will be able to:	
	61.01 Display georeferenced data measurements in 3D.	

CTE Standards and Benchmarks	NGSSS-Sci
61.02 Apply Interpolation methods.	
61.03 Utilize georeferenced 2D data in a 3D environment.	
61.04 Create contour lines in a 3D environment.	