

# DESIGNING DATABASES WITH VISIO PROFESSIONAL: A TUTORIAL

# A

Microsoft Visio Professional is a powerful database design and modeling tool. The Visio software has so many features that it is impossible to demonstrate all of them in this short tutorial. However, you will learn how to:

- Start Visio Professional.
- Select the Crow's Foot entity relationship diagram (ERD) option.
- Create the entities and define their components.
- Create the relationships between the entities and define the nature of those relationships.
- Edit the Crow's Foot ERDs.
- Insert text into the design grid and format the text.

# X

# I

# D

# N

# E

# A

# P

# P

# E

# A



**P**review

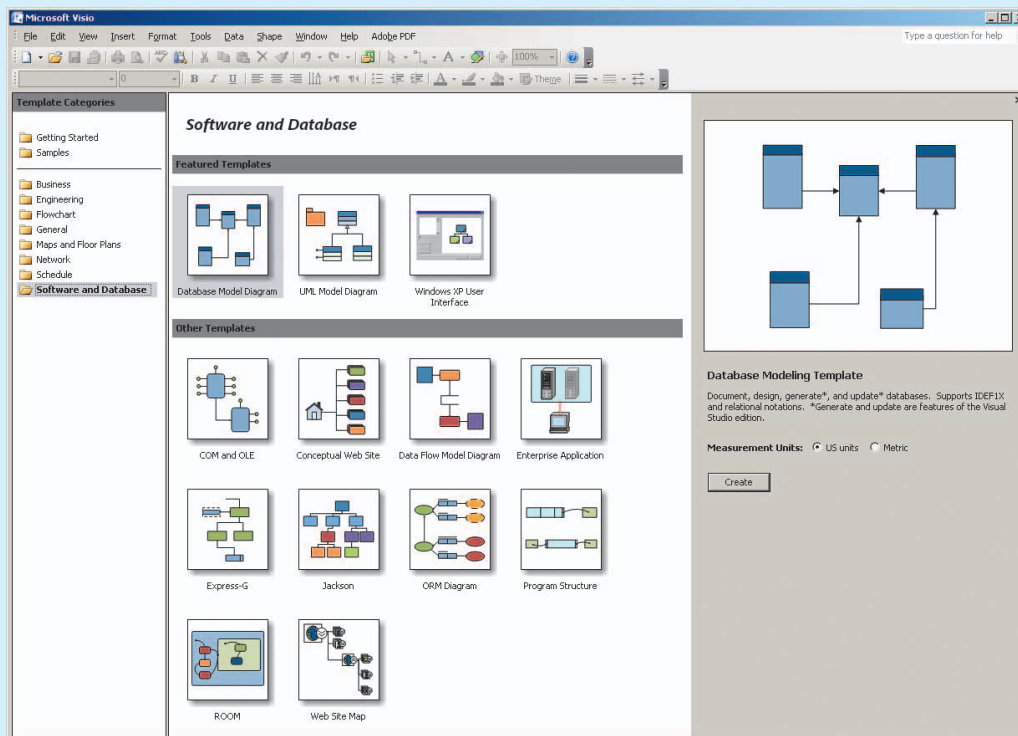
Once you have learned how to create a Visio Crow's Foot ERD, you will be sufficiently familiar with the basic Visio Professional software features to experiment on your own with other modeling and diagramming options. You will also learn how to insert text into the Visio diagram to document features you consider especially important or to simply provide an explanation of some segment of the ERD.

Note: The screens and instructions in this tutorial are for Microsoft Visio Professional 2007. If you are using an earlier version of Visio, your screen will vary slightly. If you are using Visio 2007 and you wish to save files that are also usable in Visio 2003, you must use the File, Save As menu choice and choose to save the file in Visio 2003 format.

## A.1 STARTING VISIO PROFESSIONAL

The typical Visio Professional software installation lets you select Visio through the **Start, (All) Programs, Microsoft Office Visio** sequence. If Microsoft Office has also been installed, then Visio may be found under Microsoft Office in the Start menu. After the Visio software has been activated, click the **Software and Database** option to match the screen shown in Figure A.1. (Previously created Visio files show up in the **Recent Documents** header on the right side of the screen.)

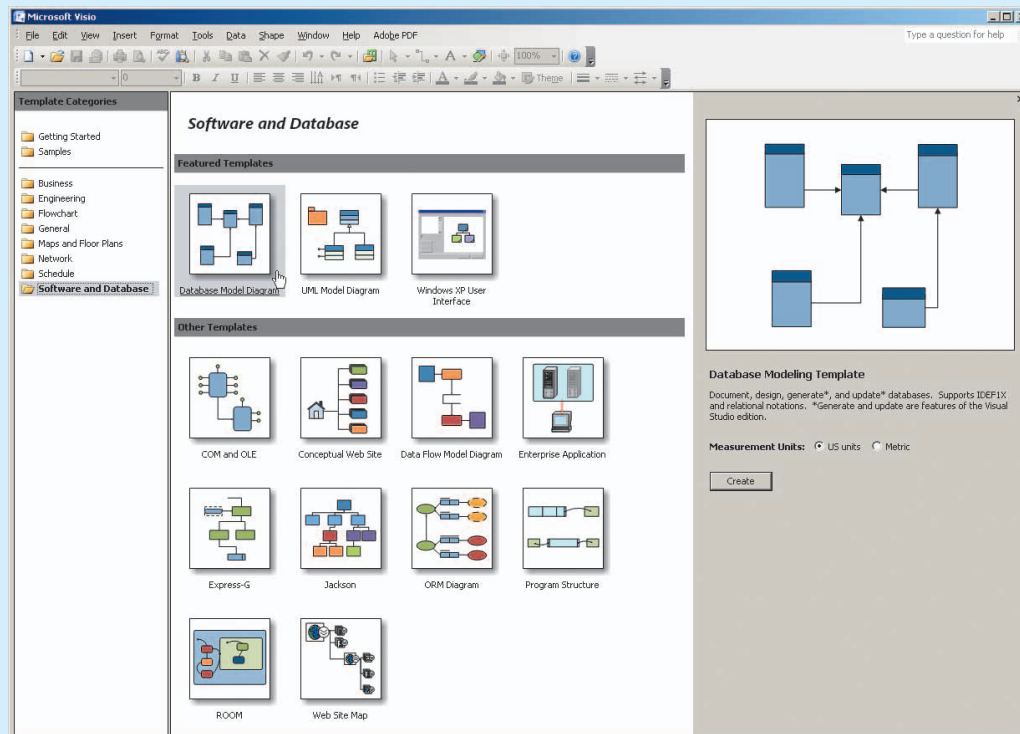
**FIGURE A.1** The Visio Professional opening screen



As you examine Figure A.1, note the cursor over the arrow button next to the question mark at the upper-right corner of the screen. The cursor shows the various toolbar options that you may select. Although you can customize your toolbar through this selection, for this tutorial, keep the toolbar at its default view to make sure that you will see the standard Visio screens.

With the **Software and Database** selection shown in Figure A.1, select the **Database Model Diagram** object. Note that your selection results in a gray shadow around the object. Also note that the cursor changes to a hand with a pointing finger, as shown in Figure A.2. In addition, you will see the Database Modeling Template description in the left side of your screen.

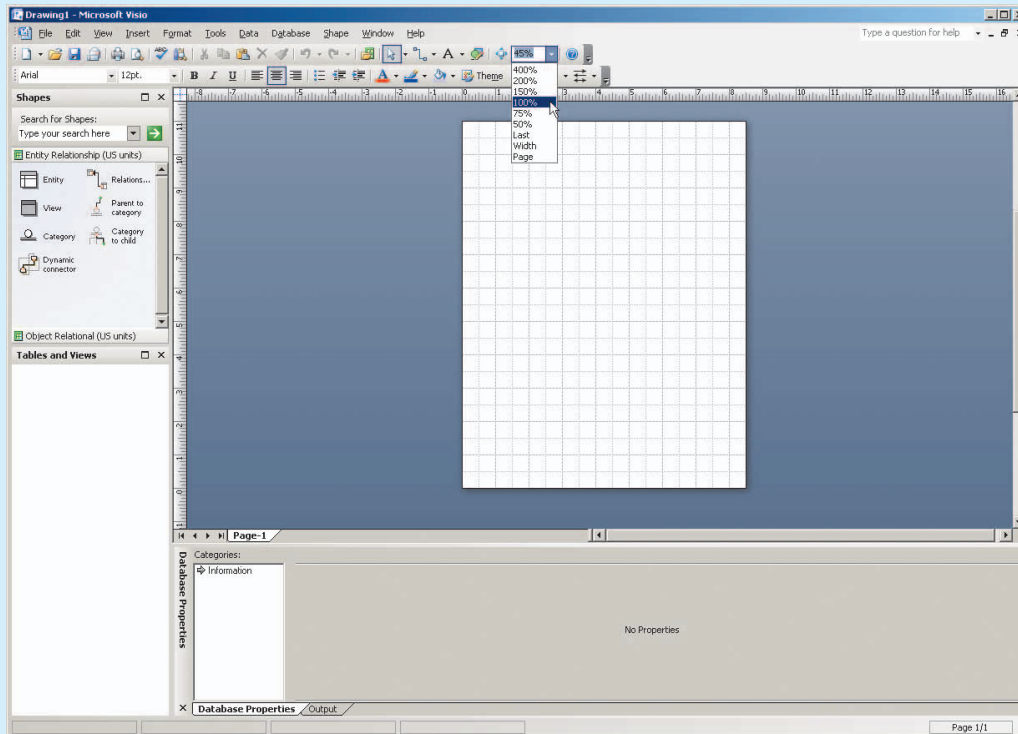
**FIGURE A.2** The database model object selection



Click the **Create** button shown in Figure A.2 to produce the screen shown in Figure A.3. Because the preference here is for a larger grid than the one shown in Figure A.3, start by clicking the size selection (zoom) list box located on the button bar at the top of the screen. Click the **down arrow** to generate the list of size options, shown as percentages. Figure A.3 shows that the **100%** option has been selected. When you click the 100% selection, the grid expands to fill the screen.

By selecting the Visio Professional database option and its drawing board, you have completed the preliminary work required to create ERDs. You are now ready to draw the ERDs on the drawing board. You will use the Crow's Foot option, the same one used to create all of the ERDs in this text.

**FIGURE A.3** The drawing board size option



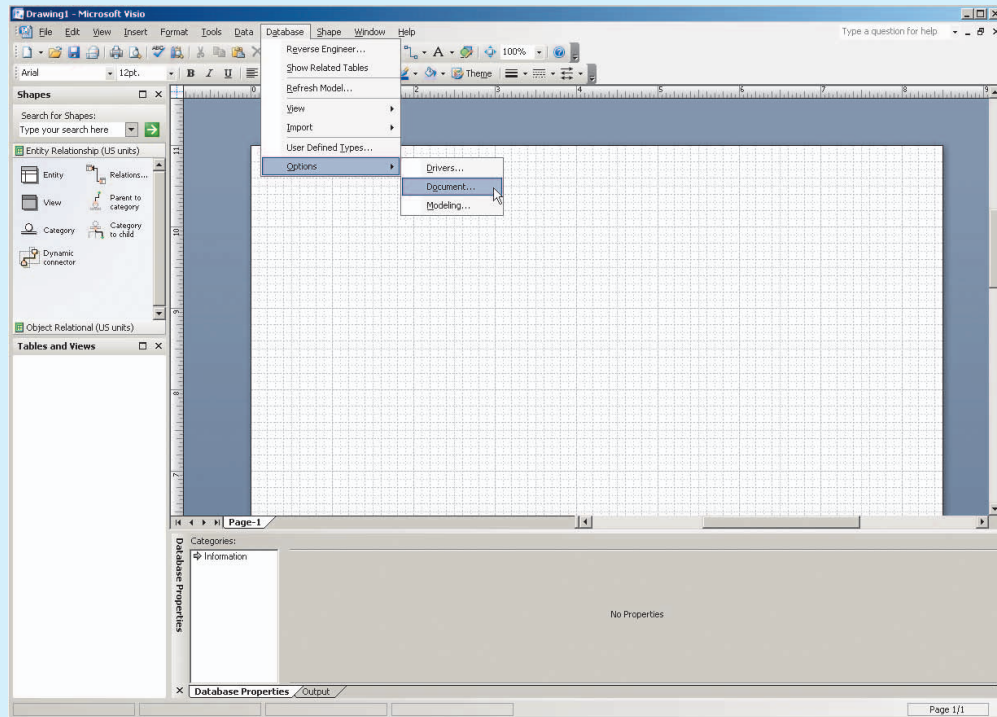
## A.2 SETTING THE STAGE FOR CREATING A CROW'S FOOT ERD

To select the Crow's Foot option, select the **Database, Options, Document...** sequence shown in Figure A.4. (Note that the drawing grid has expanded in response to the 100% selection shown in Figure A.3.)

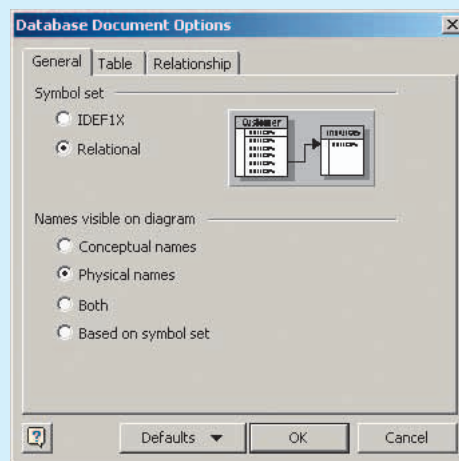
When you click the **Document...** option shown in Figure A.4, you will see the **Database Document Options** window in Figure A.5. The default selection is the **General** tab shown in Figure A.5. Note that the default selections in the **General** tab are **Relational** and **Physical names**. Leave the default options shown in Figure A.5. (The black dots inside the white circles, known as radio buttons, indicate that the option was selected.) If your screen does not show these selections, click their radio buttons to place the black dot inside the white circle.

Move the cursor to the **Relationship** tab shown in Figure A.5. Click to select it to produce the screen shown in Figure A.6. Make sure that a check mark is in the check box next to the **Crow's feet** option to indicate that this option was selected. If there is no check mark, click this check box to select this option. (If a check box is "grayed out," it cannot be changed. For example, at this point, the check boxes under the **Show verb phrase** option cannot be changed because the option has not been selected.)

**FIGURE A.4** The Database/Options/Document selection

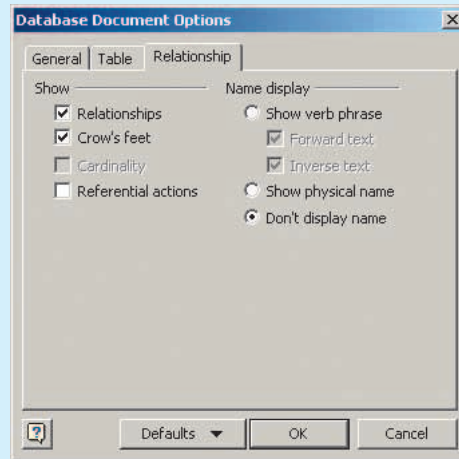


**FIGURE A.5** The Database Document Options window



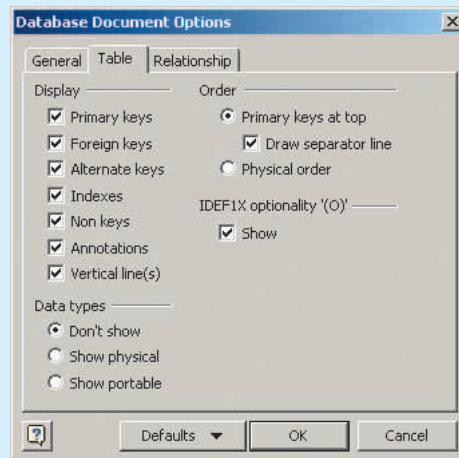
Examine Figure A.6 and note that the relationship name to be displayed has not yet been indicated; therefore, neither has *how* the names are to be displayed. You will return to this dialog box later to see the effect of these selections and to demonstrate that you can edit the displays when you are working on them.

**FIGURE A.6** The Database Document Options, Relationship tab



Next, select the **Table** tab in the Database Document Options dialog box, as shown in Figure A.7. Make sure that the check boxes are marked as shown here.

**FIGURE A.7** The Database Document Options, Table tab



Click the **OK** button shown in Figure A.7 to begin creating Crow's Foot ERDs.

### A.2.1 THE BUSINESS RULES

To illustrate the development of the Visio Professional's Crow's ERD, you will create a simple design based on the following business rules:

1. A course can generate many classes.
2. Each class is generated by a course.
3. A course may or may not generate a class.

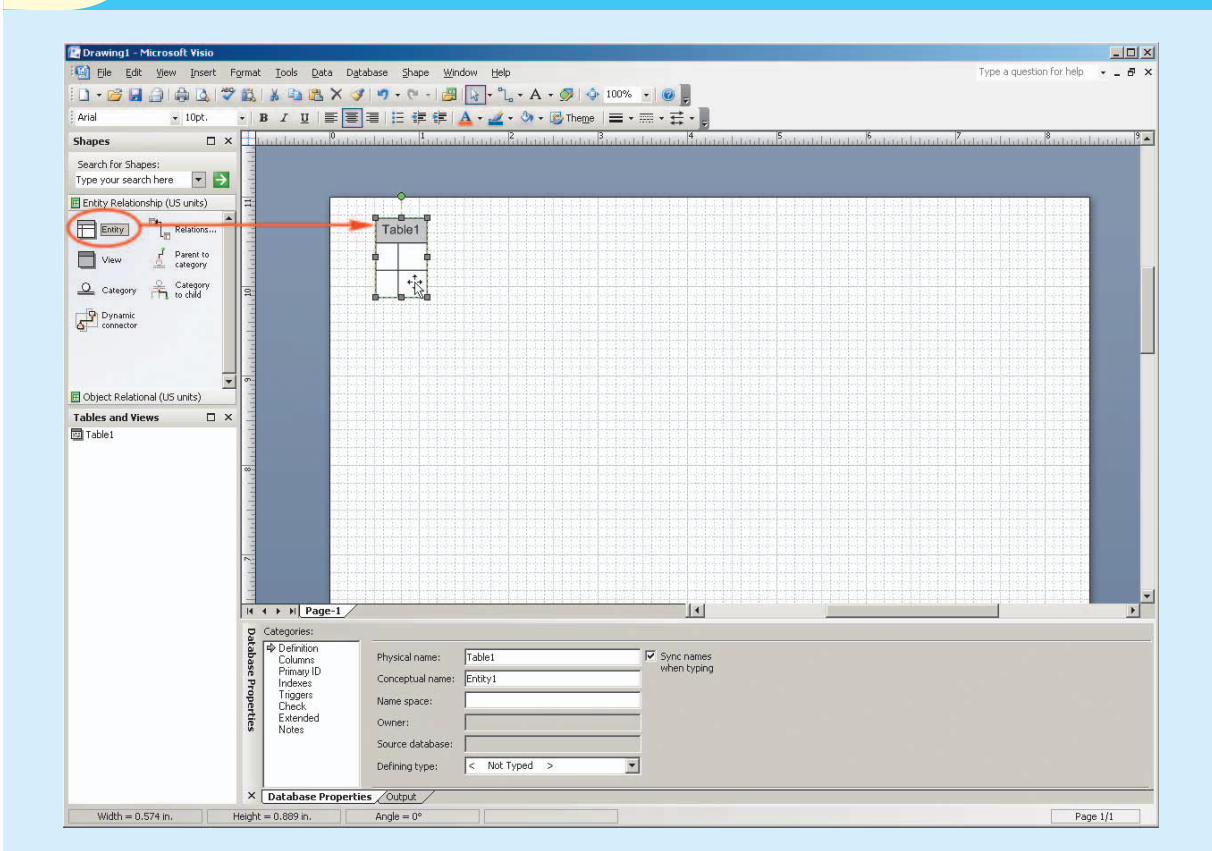


Note that a class has been defined as a section of a course. That definition reflects the real world's use of the labels *class* and *course*. Students have a *class* schedule rather than a section schedule. The catalog that lists all of the courses offered by a department is called a *course* catalog. Some courses are not taught each semester, so they may not generate a class during any given semester. In fact, some courses may be taught only when there is sufficient student demand.

### A.3 CREATING AN ENTITY

Now that you have some idea of the proposed design components, let's create the first entity for the design. Click the **Entity** object shown in Figure A.8. (It is circled in the figure.) Drag the **Entity** object to the grid and then drop it. That action will produce the **Table1** object shown in the grid in Figure A.8. (The **1** in the **Table1** label indicates that this is the first entity object to be placed on the grid.) Note that the entity object is shown as a table. That's because *the entity object is represented by a conceptual table*.

**FIGURE A.8** Placing the entity object in the grid



As you examine Figure A.8, note that the small square selection handles around the **Table1** object perimeter indicate that the **Table1** object has been selected. You can deselect the object by clicking an empty portion of the grid. If the **Table1** object has not been selected, click it to select it.

#### A.3.1 THE DATABASE PROPERTIES WINDOW

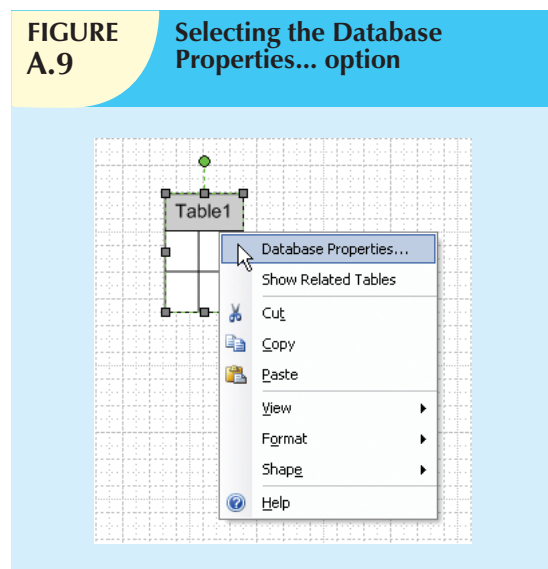
If the **Table1** object has been selected as shown in Figure A.8, you will see the default **Database Properties** window at the bottom of the screen. (You will see later in this section that the window's location and format may

be changed to become the new default. However, you will start by using the standard default window shown in Figure A.8.)

As you examine the **Database Properties** window in Figure A.8, note the selection of the **Definition** option in the **Categories:** listing. (To select any option in the list, click it. The selection is indicated by the arrow to the left of the option. In this case, the arrow appears next to the **Definition** option.) At this point, the default **Table1** label shows up in the **Physical name:** slot.

### A.3.2 CREATING THE DEFAULT DATABASE PROPERTIES WINDOW

Depending on how you configured the Visio Professional software and/or on what operating system you use, you may not see the Database Properties window shown in Figure A.8. If your screen does not show a default Database Properties window, right-click the **Table1** object in the grid to generate the **Database Properties...** option shown in Figure A.9.



Click the **Database Properties...** option shown in Figure A.9, and a **Database Properties** window appears somewhere on the screen. Figure A.10 shows you a typical result. In that example, the **Database Properties** window is located on the grid, next to the **Table1** object. You will learn how to change the window's location and format.

### A.3.3 SIZING THE DATABASE PROPERTIES WINDOW

You can size the **Database Properties** window as you would size any Windows object. For example, note that placing the cursor on the right margin (see Figure A.11) changes the cursor's shape to a double-sided arrow in preparation for widening the window by dragging its right limit.

### A.3.4 MOVING THE DATABASE PROPERTIES WINDOW

You can also drag and drop the entire **Database Properties** window to the screen's lower-left corner. (See Figure A.12.)

Naturally, you can also drag and drop the **Database Properties** window back to its original position depicted in Figure A.8. (Just drag and drop to the screen's bottom margin.) Because that location allows you to see more of the database properties without blocking part of the entities you draw on the screen; that's the position you'll use.

### A.3.5 CREATING THE ENTITY NAME

First, create a **COURSE** entity by placing the cursor in the **Physical name:** slot, and typing **COURSE**, as shown in Figure A.13. Because the **Sync names when typing** (default) option was selected in Figure A.13, the **Physical name:** and **Conceptual name:** entries are the same.

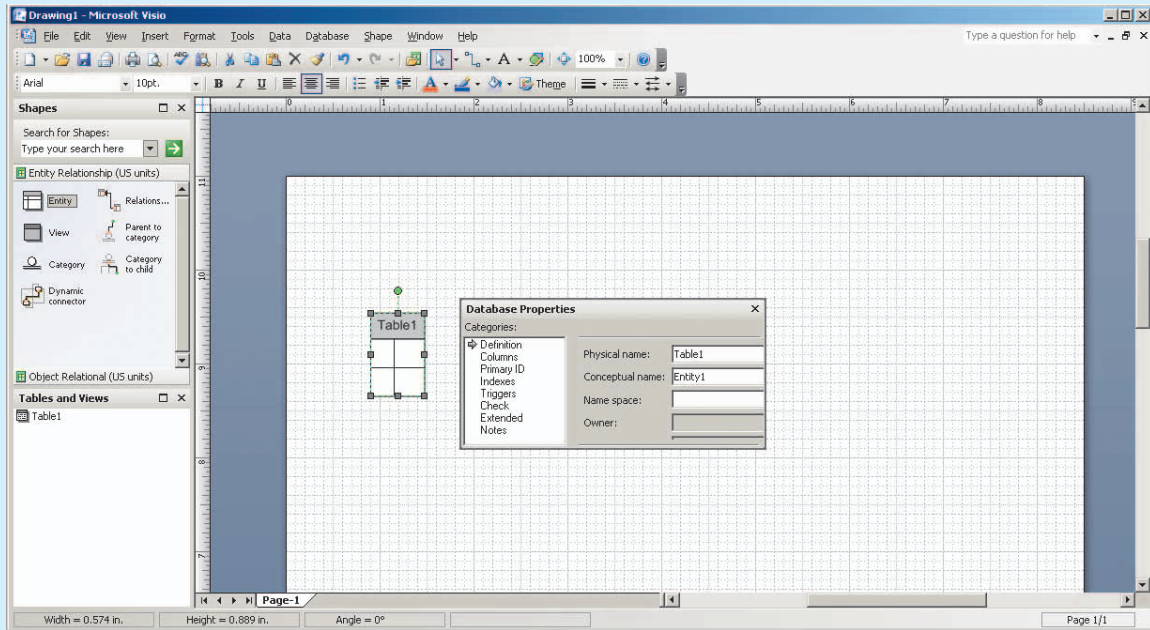
When you have finished typing the **COURSE** label in the **Physical name:** slot, as shown in Figure A.13, note that the conceptual table in the grid automatically inherits the **COURSE** label. You are now ready to start defining the table columns.

### A.3.6 DEFINING THE ENTITY ATTRIBUTES (COLUMNS)

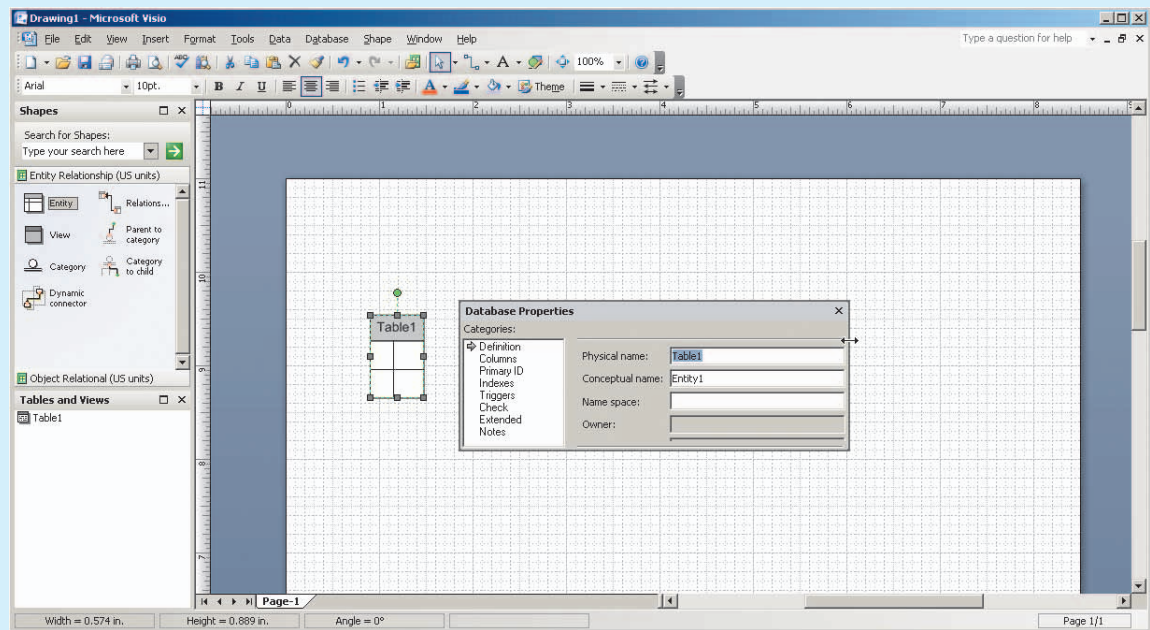
Each table column represents one of the characteristics (attributes or fields) of the entity. For example, if the **COURSE** entity, represented by the **COURSE** table, is described by the course code, the course description, and the course



**FIGURE A.10** The moved Database Properties window

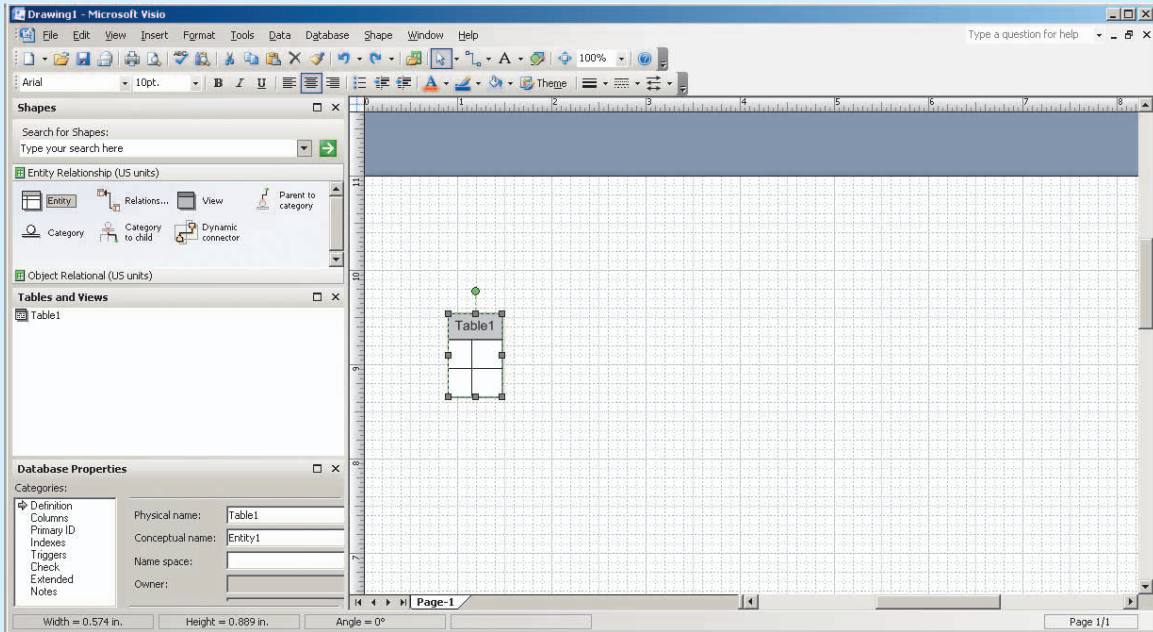


**FIGURE A.11** Sizing the Database Properties window

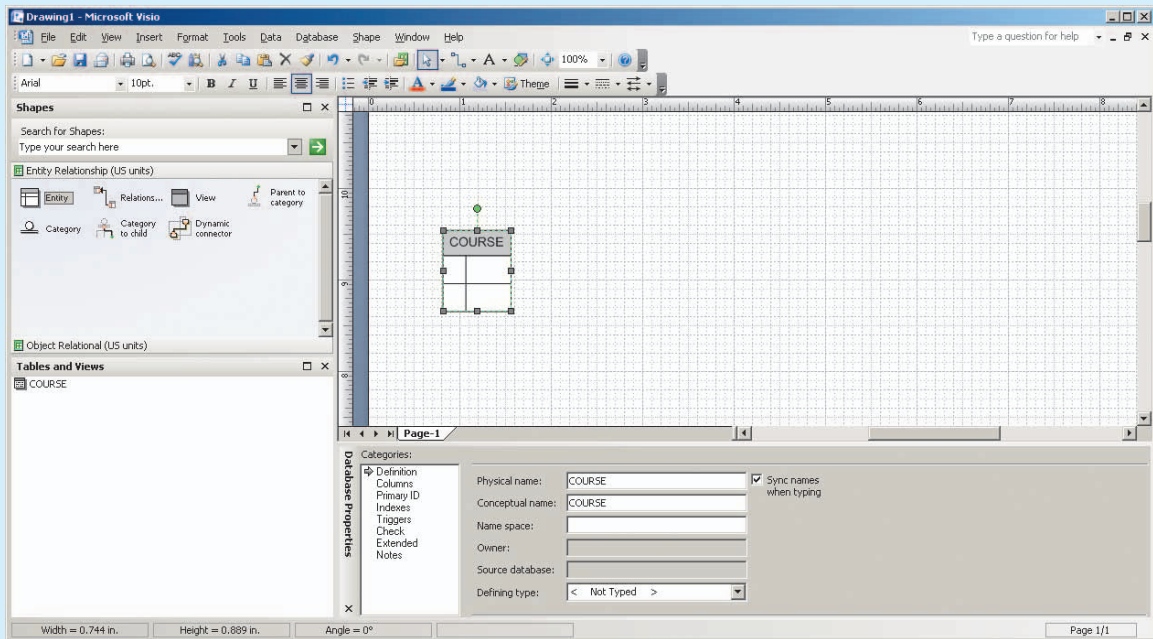


credits, you can expect to define three columns in the COURSE table. Table A.1 provides a preview of the expected COURSE table structure. (A few sample records are entered to give you an idea of the COURSE table contents.)

**FIGURE A.12** The Database Properties window in the lower-left corner



**FIGURE A.13** Type the entity's physical name

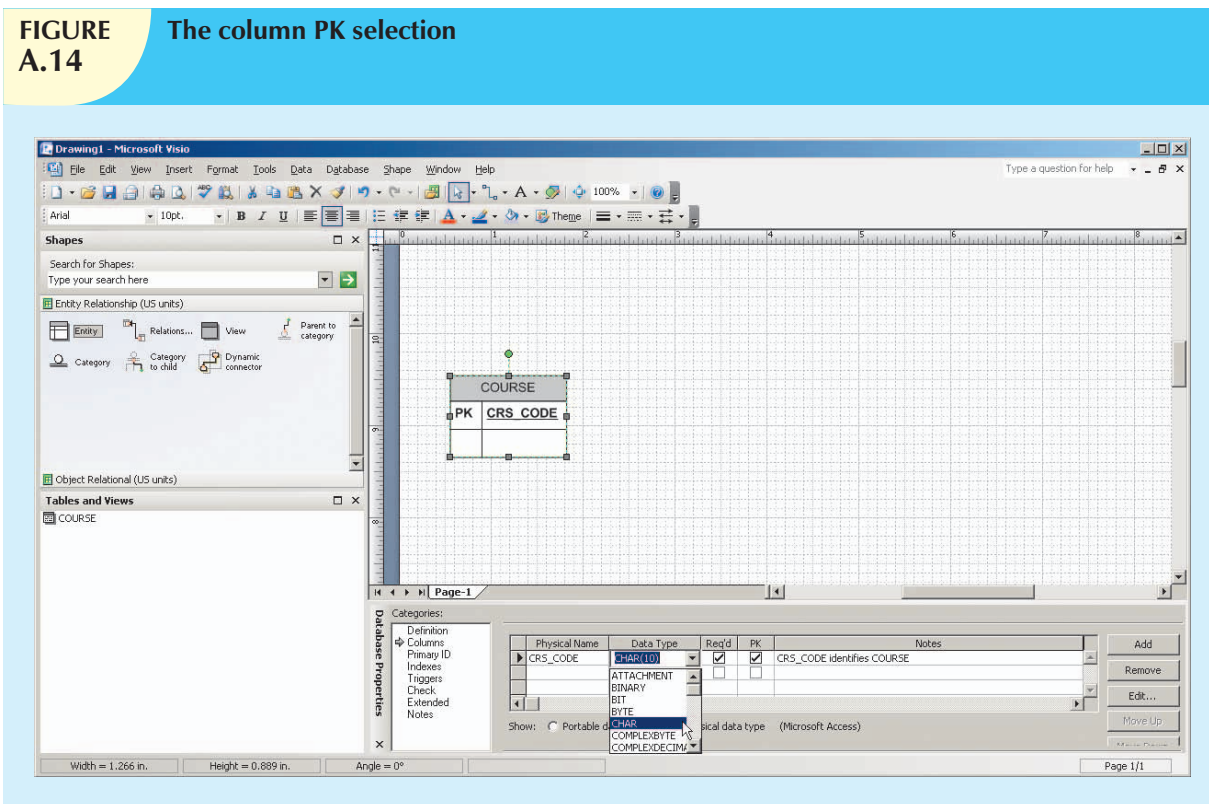


**TABLE A.1** Some Sample Course Records

CRS_CODE	CRS_TITLE	CRS_DESCRIPTION	CRS_CREDITS
ACCT-345	Managerial Accounting	Accounting as a management tool. Prerequisites: Junior standing and ACCT-234 and 245.	3
CIS-456	Database Systems Design	Creation of conceptual models, logical models, and design implementation. Includes basic database applications development and the role of the database administrator. Prerequisites: Senior standing and at least 12 credit hours in computer information systems, including CIS-234 and CIS-345.	4
ECON-101	Introduction to Economics	An introduction to economic history and basic economic principles. Not available for credit to economics and finance majors.	3

To define the columns of the COURSE table, you must assign column names and characteristics. The first column in the COURSE table will be the CRS\_CODE, which serves as the table’s primary key (PK). Because typical course code entries might be values such as CIS-456 or ACCT-345, each data entry involves a *character string*. In structured query language (SQL) terms, the CRS\_CODE data are best defined as CHAR() data. Figure A.14 shows you how the CRS\_CODE name and data characteristics were specified.

**FIGURE A.14** The column PK selection



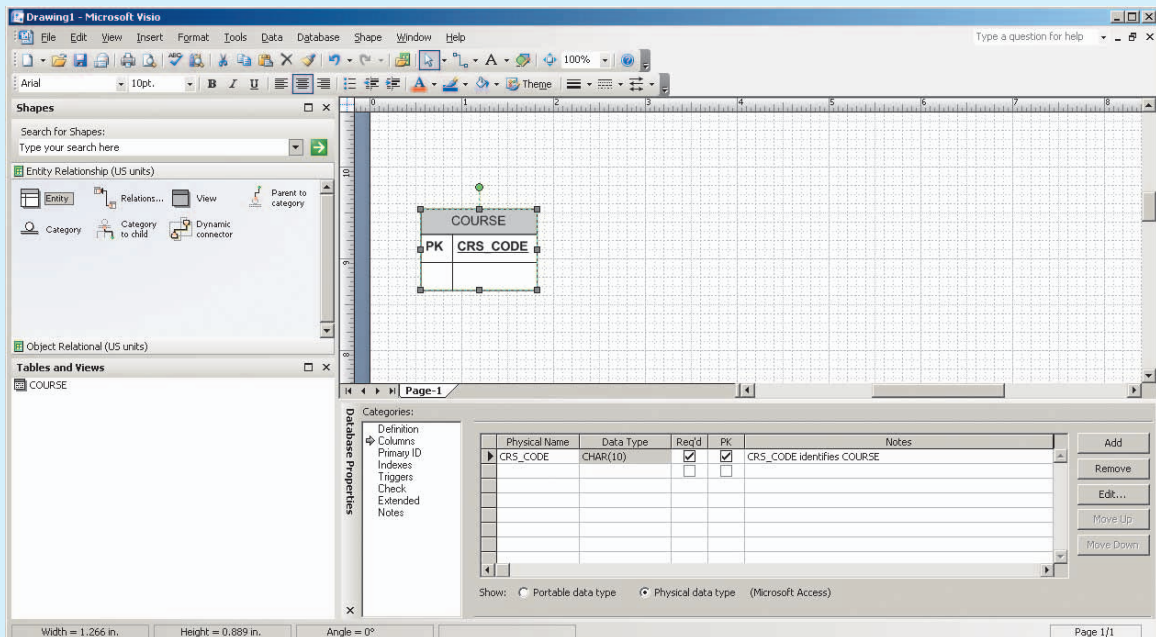


To generate the appropriate input for the column characteristics shown in Figure A.14, follow these steps:

1. Make sure that the **COURSE** table object—shown in the grid—is selected. (The handles around the perimeter show that the selection was made properly.)
2. Select the **Columns** option in the **Database Properties** window at the bottom of the screen. (Note that the selection was marked with an arrow.)
3. Step 2 generates the column-specific dialog box. Type **CRS\_CODE** in the first line under the **Physical Name** header. Moving along the line for the CRS\_CODE entry:
  - a. Select the **Char** option from the drop-down list under the **Data Type** header. (Click the **down arrow** to generate the list.)
  - b. Because a course code is required to define the course offering, place a check mark—by clicking the check box—under the **Req'd** header.
  - c. Because the CRS\_CODE is the PK, place a check mark—by clicking the check box—under the **PK** header.

When you have completed those steps, you will see the screen depicted in Figure A.14. Before you enter the remaining attribute names and characteristics, enlarge the **Database Properties** window by dragging its upper limit (see Figure A.15) to increase the desired space. That action lets you see all of the remaining attributes in the COURSE table. Now place the cursor on the second **Columns** line and get ready to enter the remaining attributes.

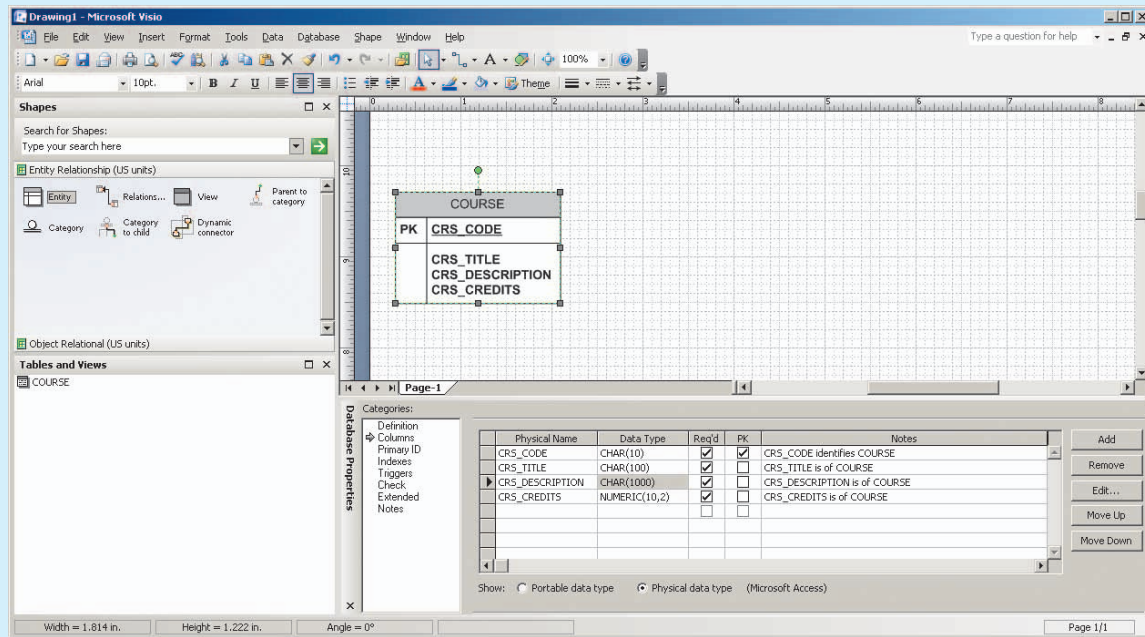
**FIGURE A.15** Drag the Database Properties box limit to show more columns



You are now ready to make the entries for the second COURSE attribute. Name this attribute **CRS\_TITLE**. Typical entries are *Database System Design* or *Managerial Accounting*. (Check the sample entries in Table A.1.) Therefore, the CRS\_TITLE is a character field. Similarly, enter the **CRS\_DESCRIPTION** entries. The course description is required, but it is not a PK. The **CRS\_CREDITS** entries are numeric, and they are required; they will be used at some point to help compute grade point averages for the students taking a section of this course. When the appropriate entries are made, the screen will look like Figure A.16. (Only a portion of the screen is shown to save space.) Note

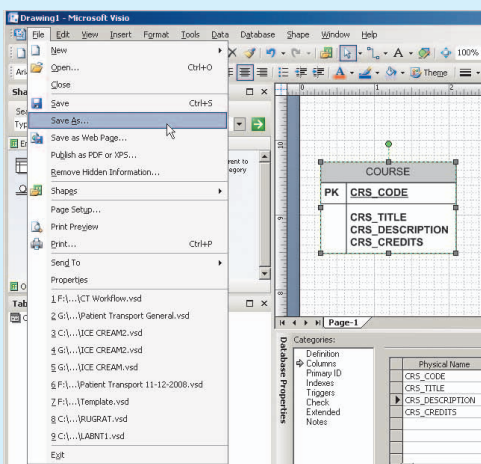
that the attribute names become boldfaced when the **Req'd** (required) option is checked for the **Column** property. Selecting that option means that the end user will be required to make a value entry for the checked attribute—after the design has been implemented—when the table is opened for data entry. Check the required option for the **CRS\_TITLE**, **CRS\_DESCRIPTION**, and **CRS\_CREDITS** columns now.

**FIGURE A.16** Enter the remaining columns



## A.4 SAVING AND OPENING THE VISIO ERD

**FIGURE A.17** Select the Save As option to save the file

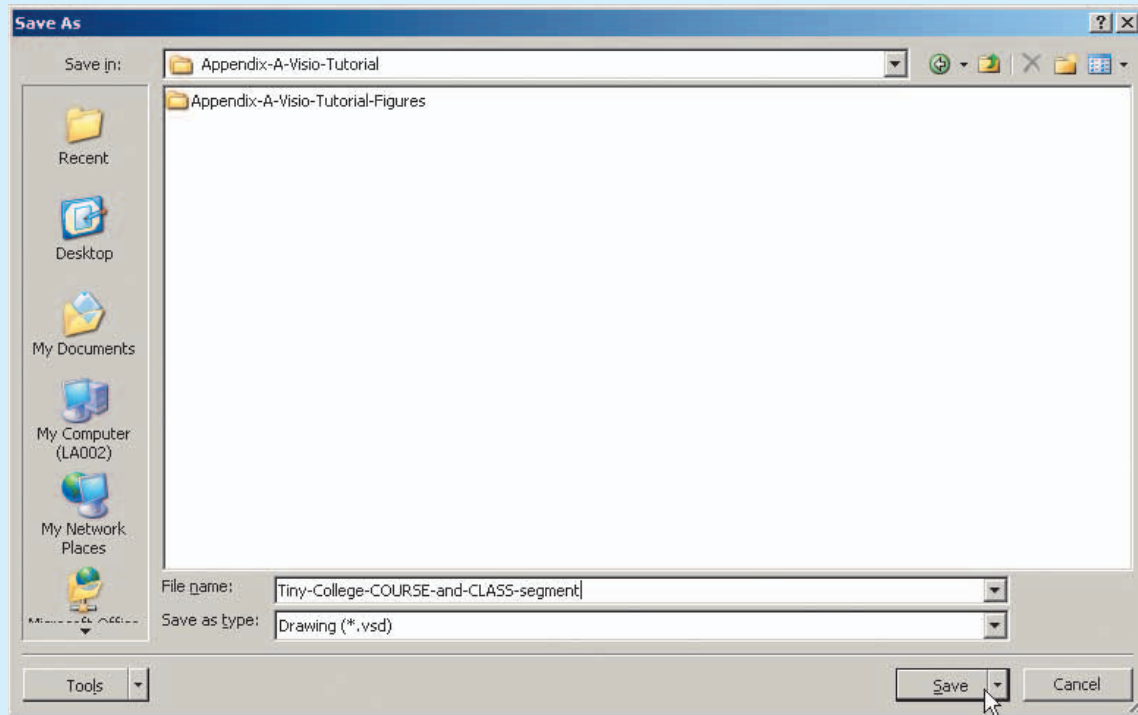


So you don't lose this first Visio Professional ERD segment, save it in an appropriate folder. Use the **File, Save As** option to select the folder location and the filename, as shown in Figures A.17 and A.18.

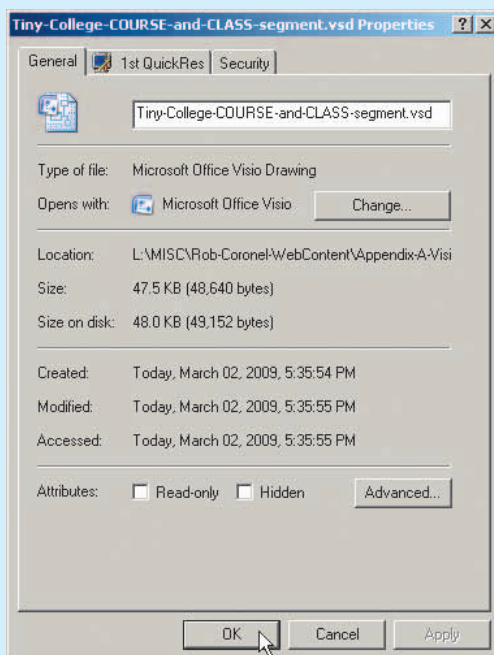
As you examine Figure A.18, note that the filename describes its origin and purpose. In this example, the ERD was named **Tiny-College-COURSE-and-CLASS-segment**. The naming convention serves the important purpose of self-documentation. Note also that the file is saved as a Visio **Drawing**.

If you want to see additional details about the file, go to the desktop, select the folder in which you have saved the file, right-click the filename, and select the **Properties** option to see the results in Figure A.19. (Note that the **General tab** is selected. If you place a check mark in the **Read-only** option, the file cannot be modified until you remove the **Read-only** option by clicking it to remove the check mark.)

**FIGURE A.18** Select the folder, type the filename, and specify the file type



**FIGURE A.19** Describe the file properties



The properties box shown in Figure A.19 was generated in Windows XP. If you use another Windows version, your Properties window, as well as the tabs across the top, will differ. However, the procedure for generating and using the Properties window is the same.

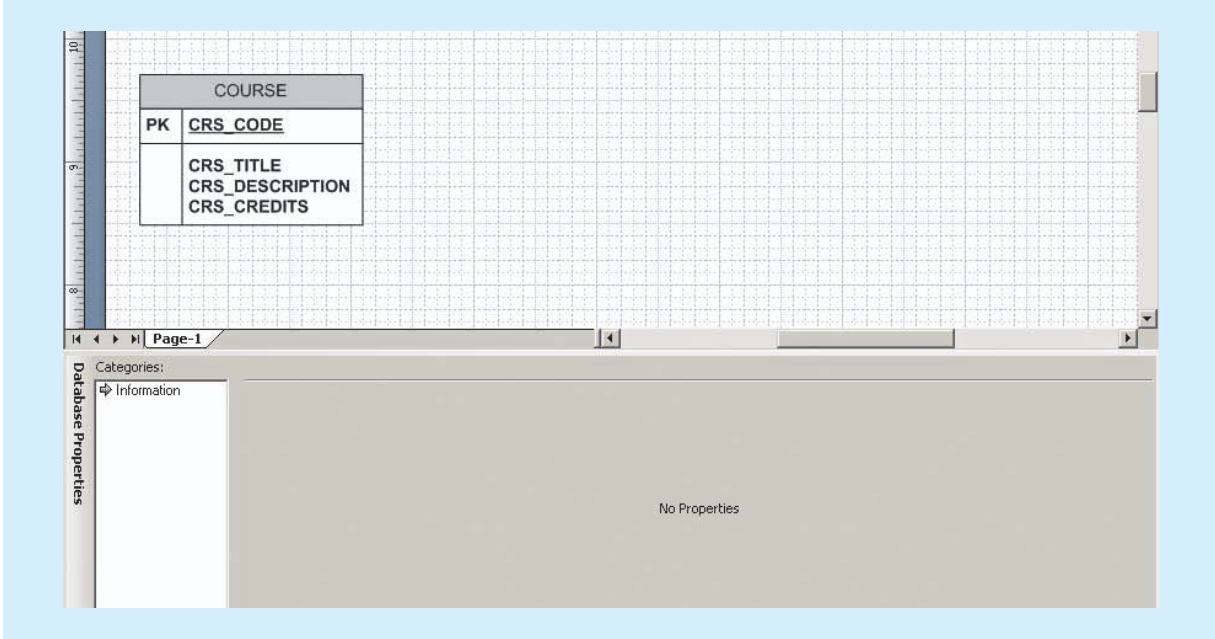
You can now go ahead and close the file—and, of course, make a backup copy! The next time you want to use the file, after you start Visio Professional, use the standard Windows **File, Open** option to retrieve and open the file. That's how the screen shown in Figure A.20 was generated.

A newly opened file may not show the Database Properties window. If the Database Properties do not appear, right-click the **COURSE** table and select **Database Properties**. Note that the just-opened file shown in Figure A.20 does not show any entity properties. To see an entity's properties in the Database Properties window, click on the entity to select it.

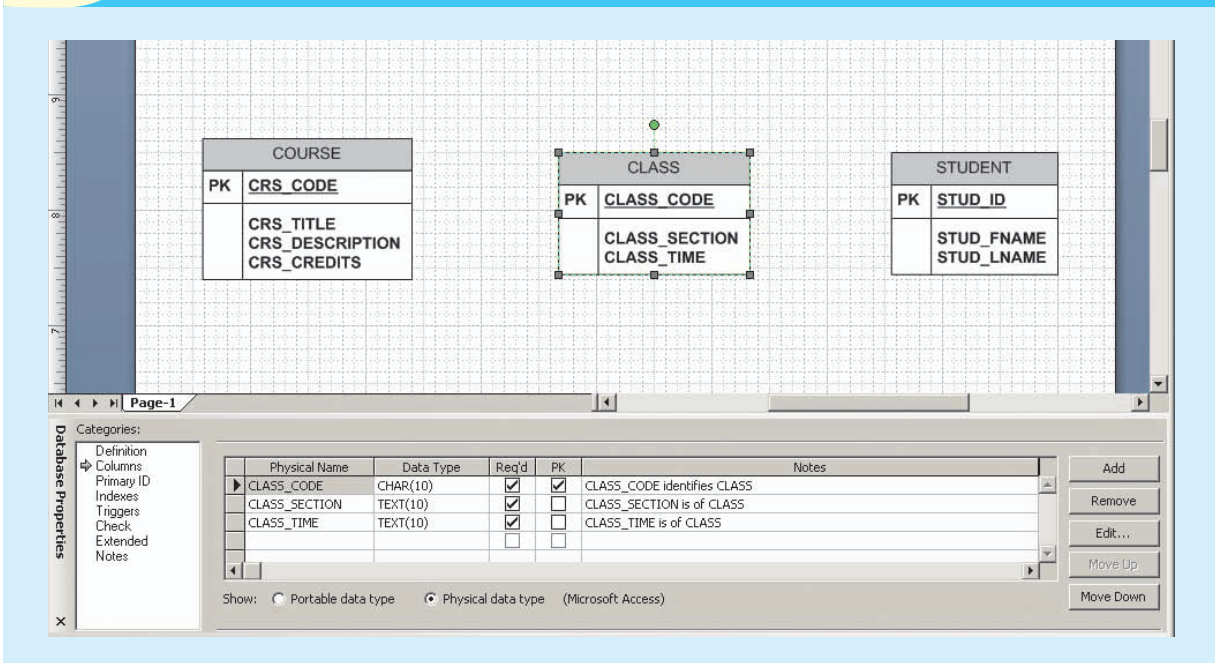
You are now ready to define the **CLASS** and **STUDENT** entities, using the same techniques you used to create the **COURSE** entity. When you are done, the screen will look like Figure A.21.



**FIGURE A.20** Open the previously saved file



**FIGURE A.21** Adding the CLASS and STUDENT entities

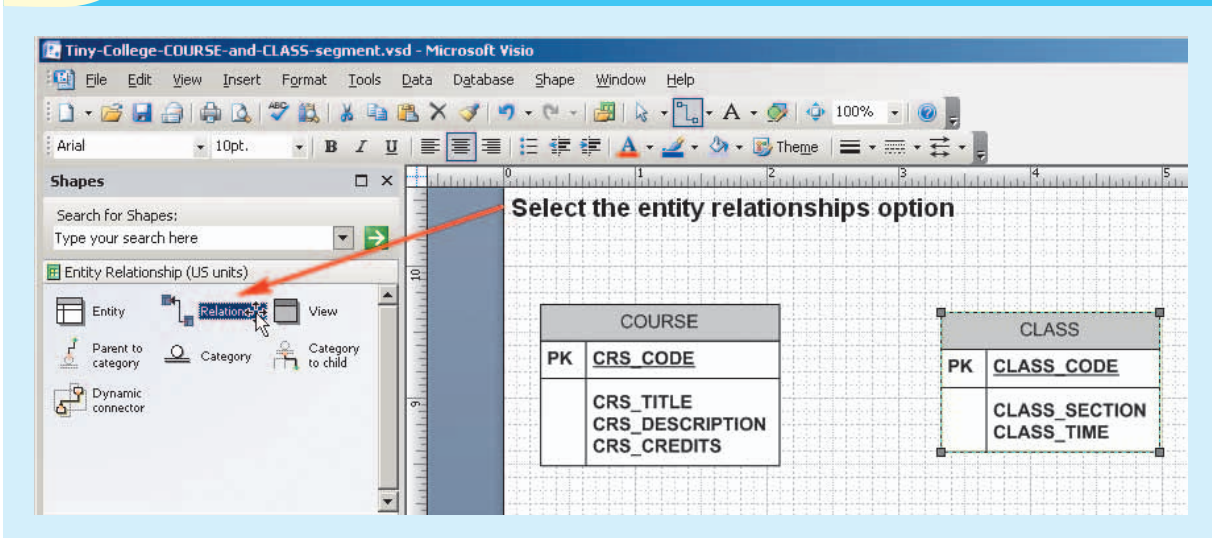


## A.5 DEFINING RELATIONSHIPS

As you examine Figure A.21, note that a foreign key (FK) has not been defined in CLASS to relate CLASS to COURSE. Instead, *Visio Professional* will define the FK field when you specify the relationship between the two

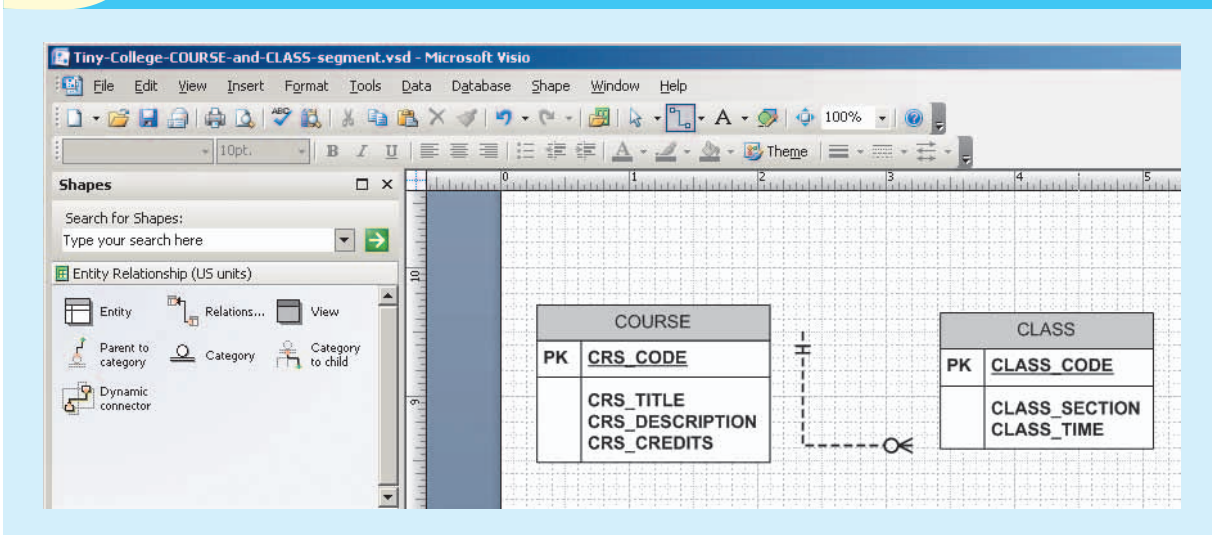
entities. Do **not** enter your own FK fields! (Visio Professional tells you what the relationship option will do for you—read the relationship text in Figure A.22).

**FIGURE A.22** Select the Relationship object



To create a relationship between the entities, click the **Relationship** object shown in Figure A.22, drag it to the grid, and drop it between the COURSE and CLASS entities to produce the results shown in Figure A.23.

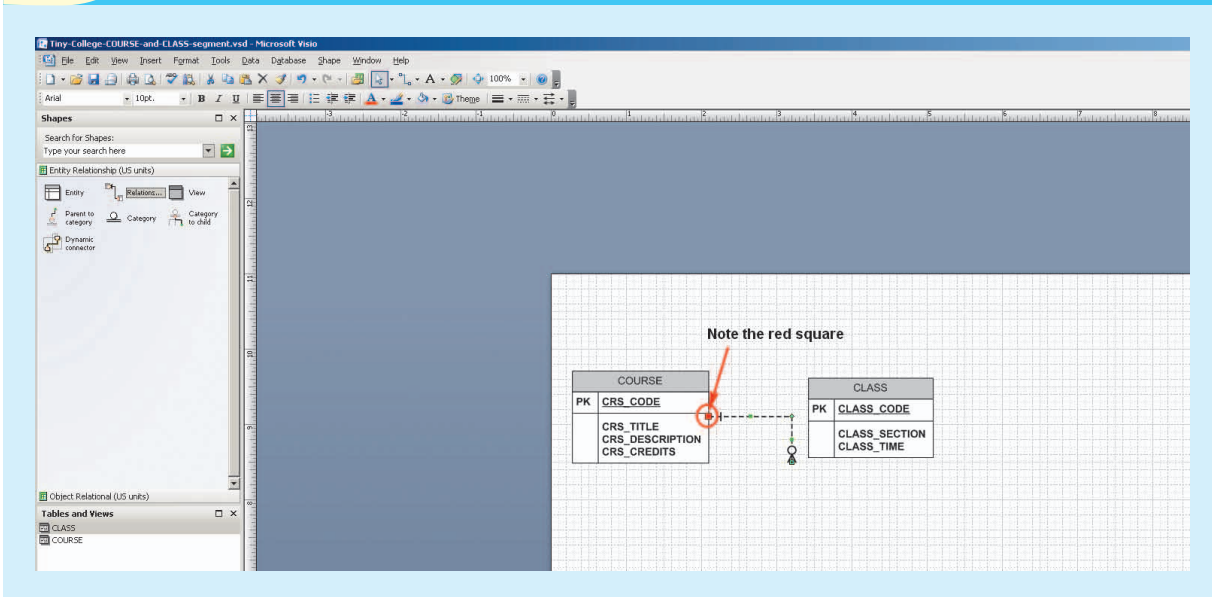
**FIGURE A.23** Drag and drop the Relationship object



Dropping the **Relationship** object on the grid produces the relationship line. Further note that the symbols at the two ends of the relationship line reflect default cardinalities of (1,1) and (0,N). Finally, remember that the relationship to be established between COURSE and CLASS reflects the business rule “One COURSE may generate many CLASSES.” Therefore, the COURSE represents the “1” side of the relationship and the CLASS represents the “many” side of the relationship.

Attach the “1” side of the relationship line to the COURSE entity by dragging the “1” end of the relationship line to the COURSE entity, as shown in Figure A.24. *Note—and this is very important—that the relationship is not attached until the COURSE table is outlined in red.* (You may have to drag the relationship line’s end all the way to the inside of the table before the red outline shows up.) When you release the relationship line, *its attachment is verified by the red square on the entity (table) perimeter.*

**FIGURE A.24** Attach the “1” side of the relationship line.



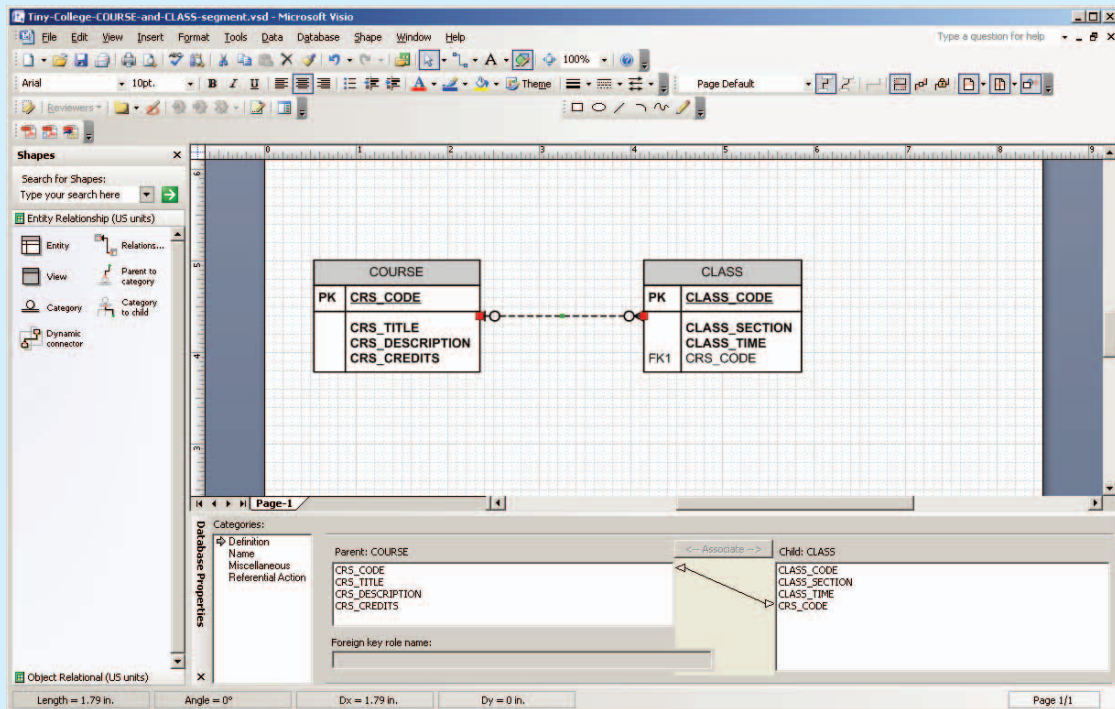
Using the same technique that was used to attach the “1” side of the relationship, drag the “M” side of the relationship line to the CLASS entity to produce Figure A.25. (Make sure that you see the red square on the CLASS entity side of the relationship line when you are done.)

As you examine Figure A.25, note these features:

1. The two red rectangles at the margin of each table indicate that the relationship was successfully established and that it is still selected. (If the relationship line is no longer selected, the red squares disappear. *To reselect the relationship line, click it.*)
2. Visio Professional created the CRS\_CODE foreign key in the CLASS table, labeling it **FK1** to indicate that it is the first FK created for this table. Note that CRS\_CODE in the CLASS table is not in boldfaced type. This lack of boldface indicates that, at this point, you have not yet specified that a FK value is mandatory. (Of course, it should be because a CLASS cannot exist without a COURSE. You will edit this FK property later.)
3. The cardinality next to COURSE was automatically changed to indicate an optional (0,1) relationship between CLASS and COURSE. Because each class must be related to one course, a depiction of a (1,1) cardinality is appropriate. (A CLASS cannot exist without a COURSE.) Therefore, you’ll have to edit this cardinality later.
4. The **Database Properties** window shows that the (default) **Definition** option is selected. (Look under the **Categories:** header.)
5. The relationship is reflected in the double-sided arrow linking the COURSE table’s CRS\_CODE and the CLASS table’s CRS\_CODE.



**FIGURE A.25** Attach the “M” side of the relationship



### A.5.1 EDITING THE CARDINALITIES

If you examine Figure A.25 carefully, you'll notice that the `CRS_CODE` in the `CLASS` entity is not in boldfaced type. This lack of boldface indicates that the `CRS_CODE` in `CLASS` may be null, thus indicating incorrectly that `COURSE` is optional to `CLASS`. To change the (0,1) cardinality in Figure A.25 to a (1,1) cardinality:

1. Select the **CLASS** entity.
2. Check the `CRS_CODE` and note that its **Req'd** check box is *not* checked. (That means that a value entry is not required, thus allowing nulls—and making the relationship between `CLASS` and `COURSE` optional.)
3. Click the `CLASS` entity's `CRS_CODE` **Req'd** check box to place a check mark in it. (That means that a value entry will be required, thus making the relationship between `CLASS` and `COURSE` mandatory.)

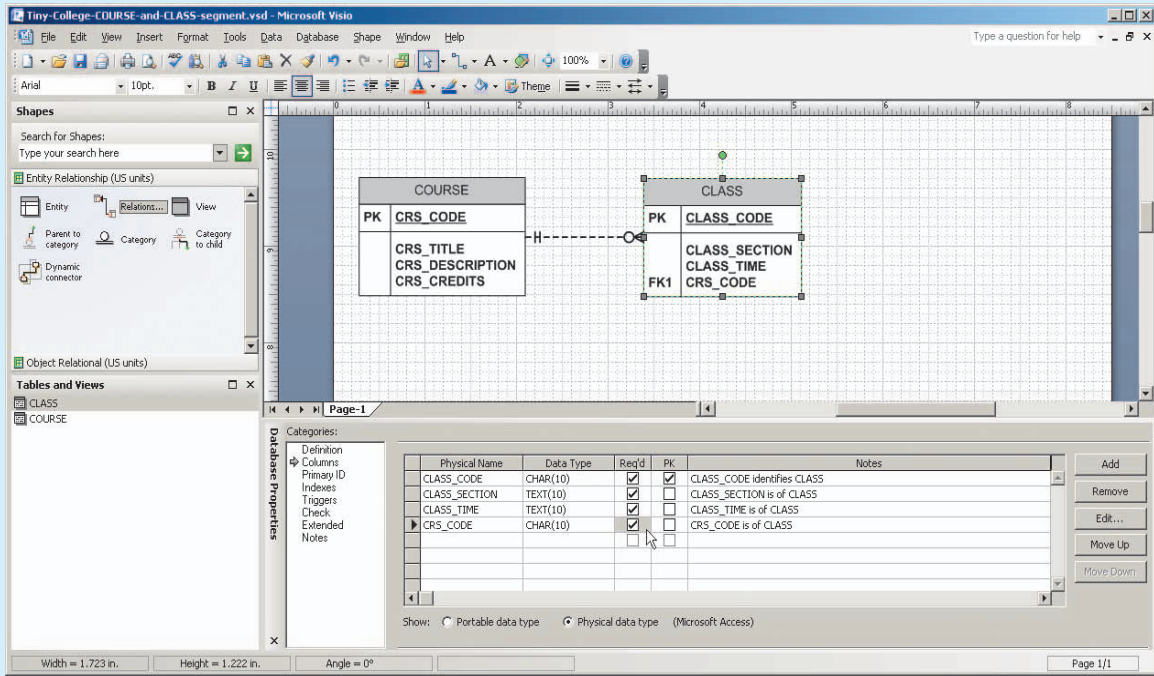
When you have completed those three steps, you will see the results in Figure A.26. Note that the `CRS_CODE` in the `CLASS` entity is now in boldface to indicate the mandatory relationship between `CLASS` and `COURSE`. That mandatory relationship is reflected by the change in the (0,1) cardinality to a (1,1) cardinality on the `COURSE` entity.

You can edit the “M” side of the 1:M relationship by selecting the **relationship line** and the **Miscellaneous** option in the **Categories:** list. Then select the **Zero or more** cardinality (if it is not already selected). Figure A.27 shows a portion of the screen after the selections have been properly made.

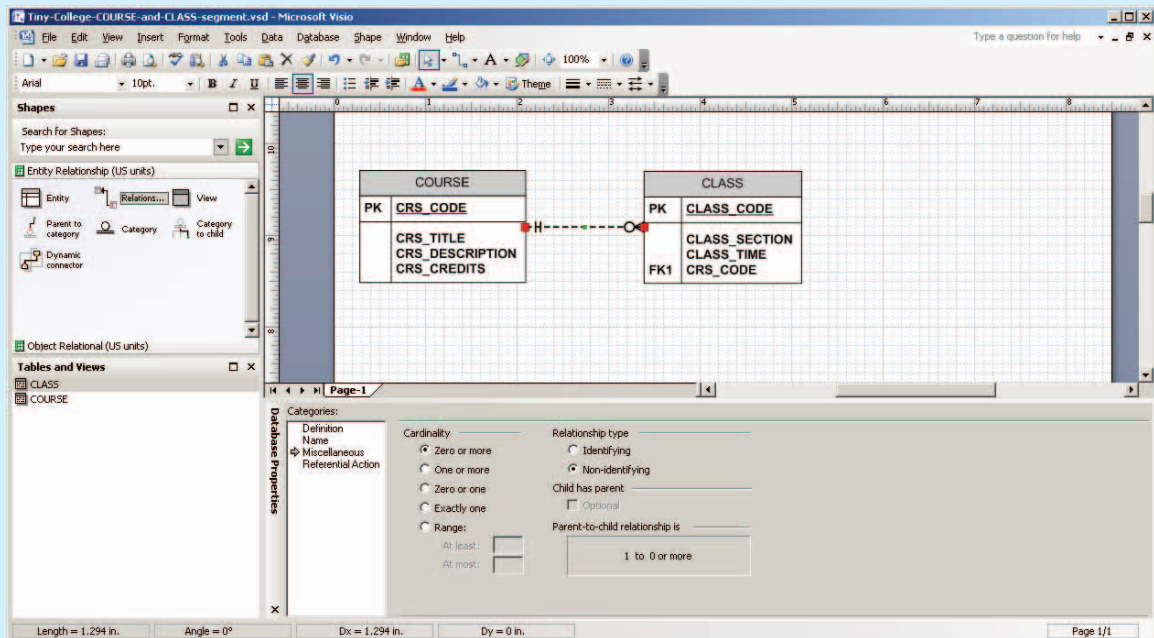
### A.5.2 CREATING A “MANY-TO-MANY” RELATIONSHIP

To create a “many-to-many” relationship between the entities, click the **Relationship** object, drag it to the grid, and drop it between the `CLASS` and `STUDENT` entities.

**FIGURE A.26** Forcing a mandatory entry for a foreign key value



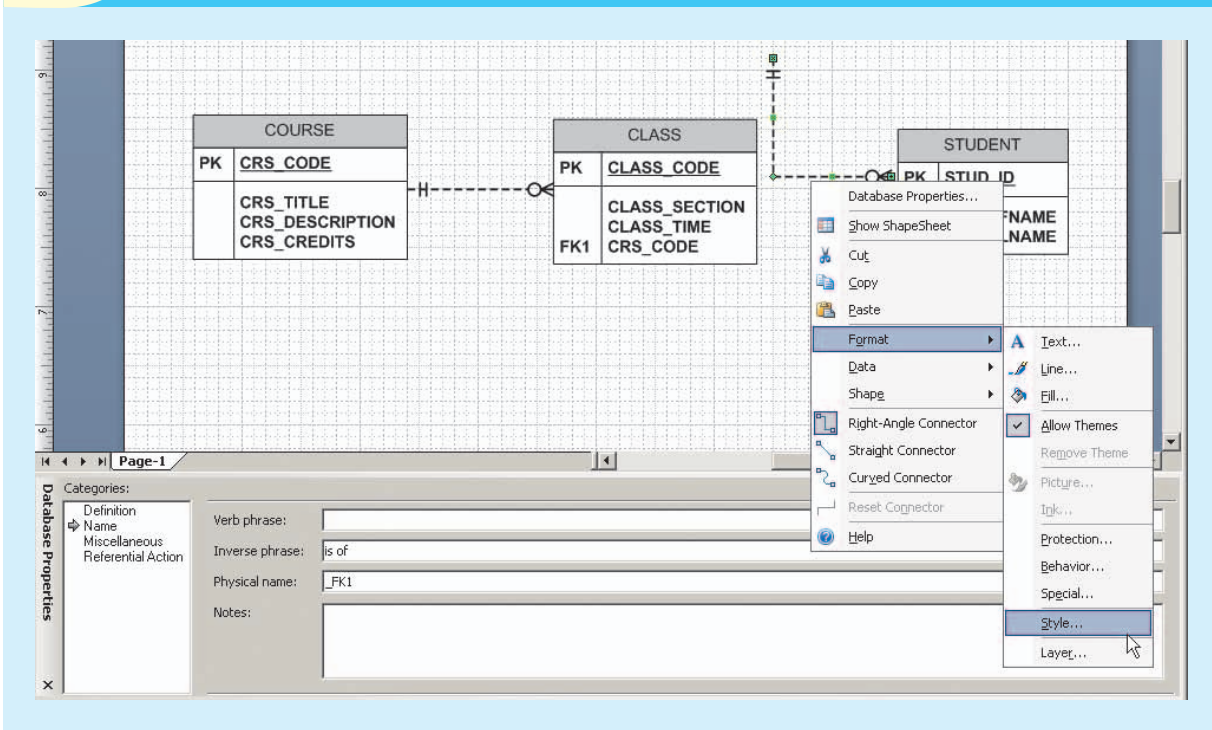
**FIGURE A.27** Selecting the cardinality for the “many” side of a relationship



Dropping the **Relationship** object on the grid produces the relationship line. Note that the symbols at the two ends of the relationship line reflect default cardinalities of (1,1) and (0,N). Finally, remember that the relationship to be established between CLASS and STUDENT reflects the business rule “Many STUDENTs may enroll in many CLASSes.” Therefore, we need to change the representation of the relationship to represent “many-to-many” side of it:

Right click on the **Relationship** line, then select **Style** from the **Format** category (see Figure A.28). If you do not have the Style options in your Format category, then you need to enable Developer mode. This can be done by clicking **Tools, Options** on the menu bar, then clicking the **Advanced** tab and clicking to check the **Run in Developer mode** option.

**FIGURE A.28** Format the style of a “many-to-many” relationship



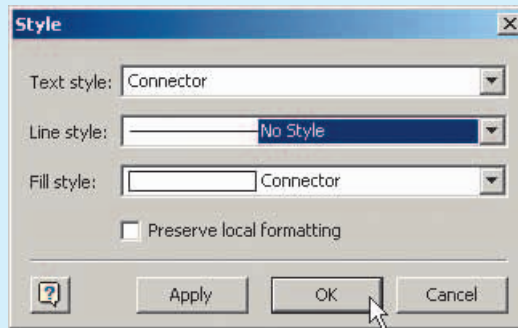
Select **No Style** as the **Line style** (see Figure A.29).

Attach one side of the relationship line to the **CLASS** entity and the other side of the relationship line to the **STUDENT** entity. Right-click the relationship line and select **Line** under the **Format** category. Select **28: Many-to-Many** as the **Begin** and **End** style for the relationship line as shown in Figure A.30.

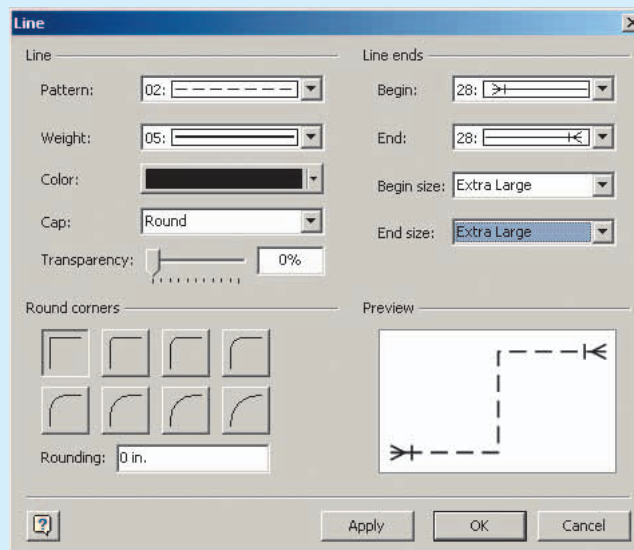
Figure A.31 shows the many-to-many relationship between CLASS and STUDENT after the selections have been properly made. As you look at Figure A.31, notice that Visio places the PK of CLASS (CLASS\_CODE) into STUDENT as a FK just as if this were a one-to-many relationship. As you learn in Chapter 3, this is not proper FK placement for a many-to-many relationship. Eventually, a bridge entity will be necessary. In Visio, you must manually remove this FK entry. So that we only have to remove this FK once, we will wait until after the following discussion of relationship types to remove it from this diagram.



**FIGURE A.29** Selecting the style of a “many-to-many” relationship



**FIGURE A.30** Selecting the line format of a “many-to-many” relationship



### A.5.3 SELECTING THE RELATIONSHIP TYPE

Re-examine Figure A.27 and note the many options you have available when you select the relationship between COURSE and CLASS. In this case, the relationship type is properly defined to be **Non-identifying** because the dependent CLASS entity did not inherit its PK from the parent COURSE entity. (When you created the CLASS entity, you defined its PK to be CLASS\_CODE, which is not found in the COURSE entity. In other words, the ERD in Figure A.27 indicates that the CLASS entity is *not* a weak entity. A weak entity always has a strong relationship—that is, an identifying relationship—with its parent entity.)

The nature of the relationships between entities, the effect of optionalities, and the existence of weak entities all have critical effects on the database design. If necessary, review Chapter 4, Entity Relationship Modeling, Section 4.1.5 (“Existence Dependence”), Section 4.1.6 (“Relationship Strength”), Section 4.1.7 (“Weak Entities”), and Section 4.1.8 (“Relationship Participation”) to review the nature and implementation of relationships.

**FIGURE A.31** Set the relationship names as the default

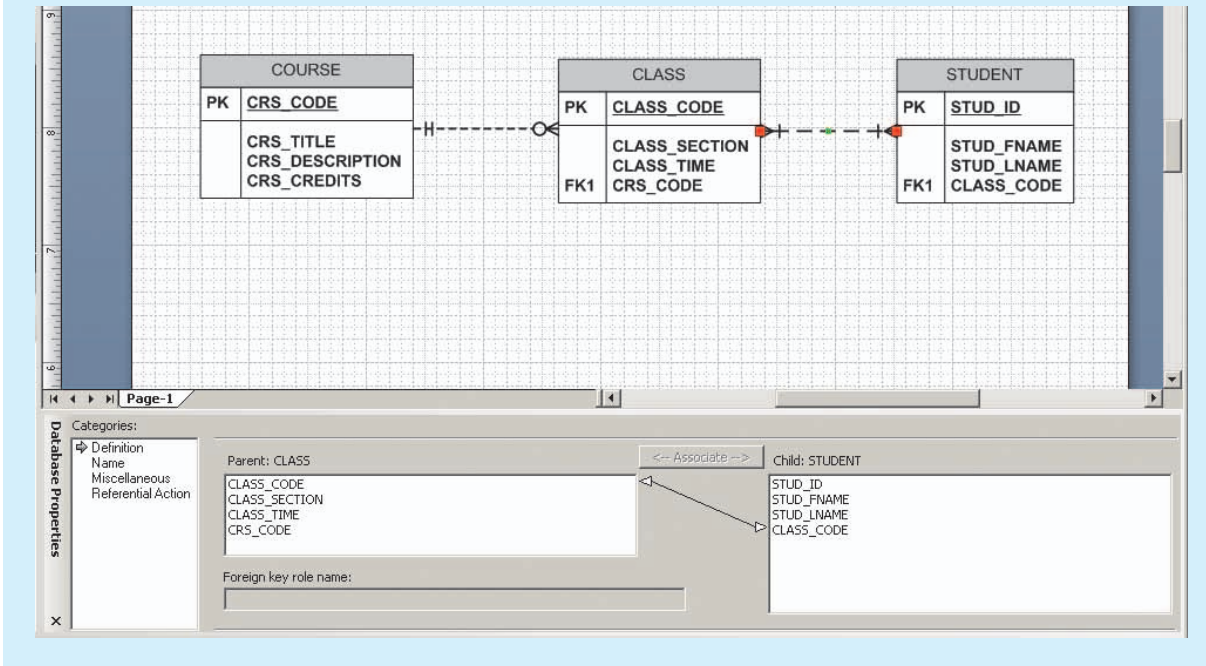
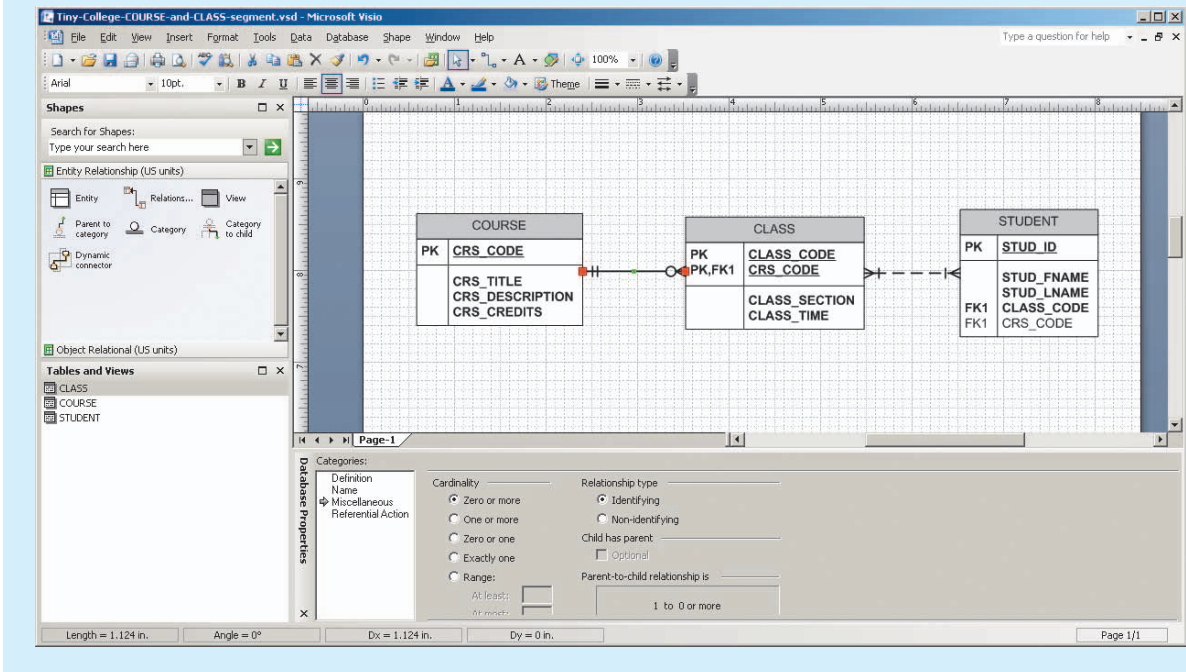


Figure A.27 shows the relationship between COURSE and CLASS as a dashed line. A dashed relationship line between two entities always indicates a non-identifying (weak) relationship between those entities. From reviewing the material above, you know that a weak (non-identifying) relationship always indicates the existence of a strong dependent entity. Conversely, a strong (identifying) relationship always indicates the existence of a weak dependent entity.

If you select an *identifying* relationship between COURSE and CLASS, Visio Professional will automatically rewrite the PK of the CLASS entity for you and the relationship line will be solid. Figure A.32 shows the effect of the relationship revision. After you have examined the effect of the identifying relationship selection, reset the relationship type to the one shown in Figure A.27. (If you want to preserve the identifying relationship version of the ERD, save it with a different name, such as **Tiny-College-COURSE-and-CLASS-segment-Identifying-Relationship**.) At this point, we can remove the inappropriate FK, CLASS\_CODE, from the STUDENT entity. Select the **STUDENT** entity, and under **Categories** in the Database Properties window choose **Columns**. Click the **CLASS\_CODE** attribute and then click the **Remove** button to delete this attribute from the STUDENT entity. Be aware that if you change the PK of the CLASS entity, Visio will again place a FK in STUDENT.

**FIGURE A.32** An illustration of an identifying (strong) relationship



#### A.5.4 NAMING THE RELATIONSHIPS

Make sure that the relationship line is still selected. Then click the **Name** option in the **Database Properties** window—look under the **Categories:** header—to produce the results displayed in Figure A.33. (Note that the original ERD has been used to show the preferred non-identifying relationship between COURSE and CLASS.)

As you examine Figure A.33, note that the default **Verb phrase:** selection is **has** and that the default **Inverse phrase:** selection is **is of**. It's useful to remember that:

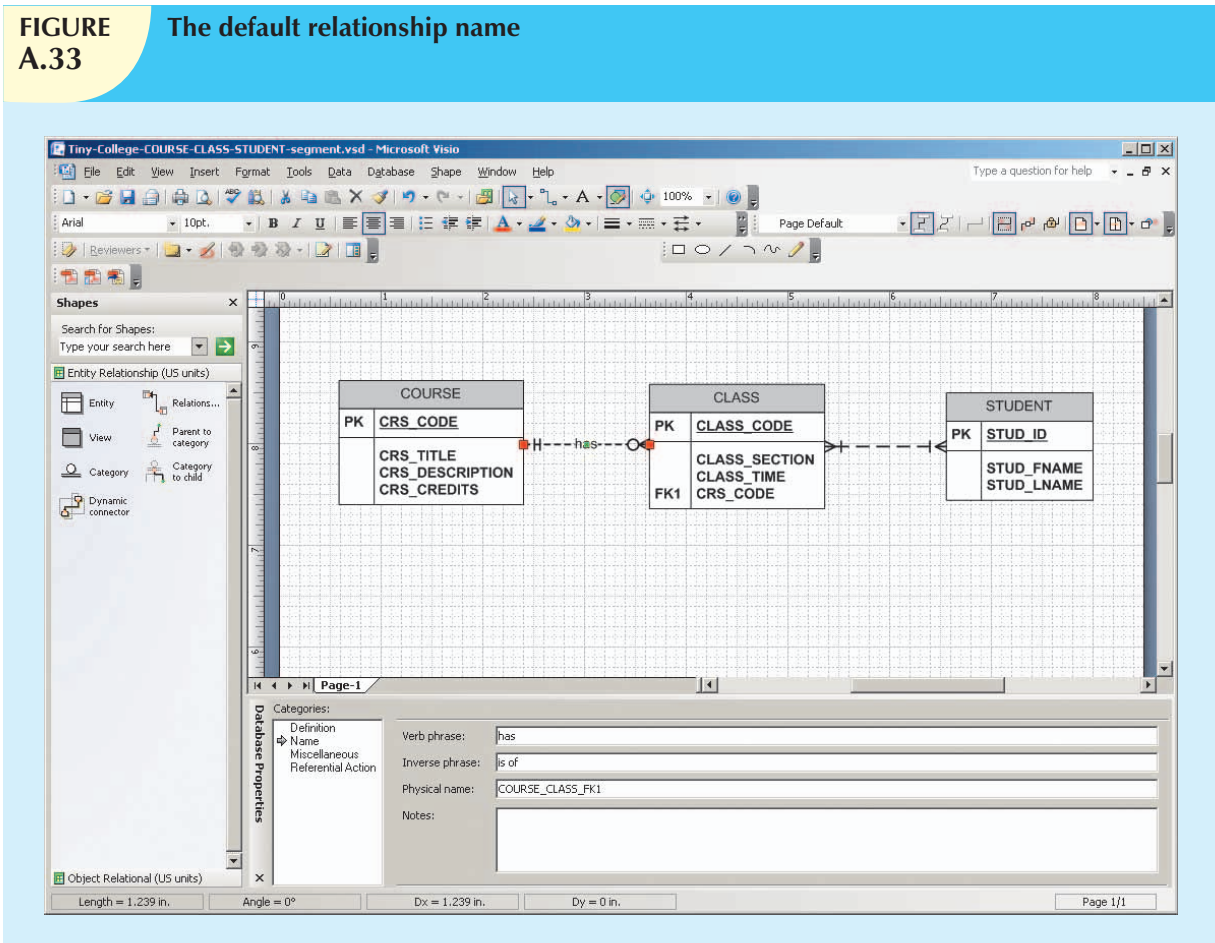
1. All relationships are defined both ways—from the “1” to the “M” side and from the “M” to the “1” side.
2. Active verbs are used to label relationships from the “1” to the “M” side. Passive verbs are used to label relationships from the “M” to the “1” side.
3. Relationship names are written in lowercase.

Using the **Name** selection in Figure A.33, type the **Verb phrase:** and **Inverse phrase:** entries as shown in Figure A.34. Note that active and passive verbs have been selected to describe the relationship between COURSE and CLASS both ways:

1. COURSE **generates** CLASS.
2. CLASS **is generated by** COURSE.

Also note that in Figure A.34, the ERD has been dragged to the bottom of the screen to save space and still show how all of the components are relevant to the discussion.

**FIGURE A.33** The default relationship name

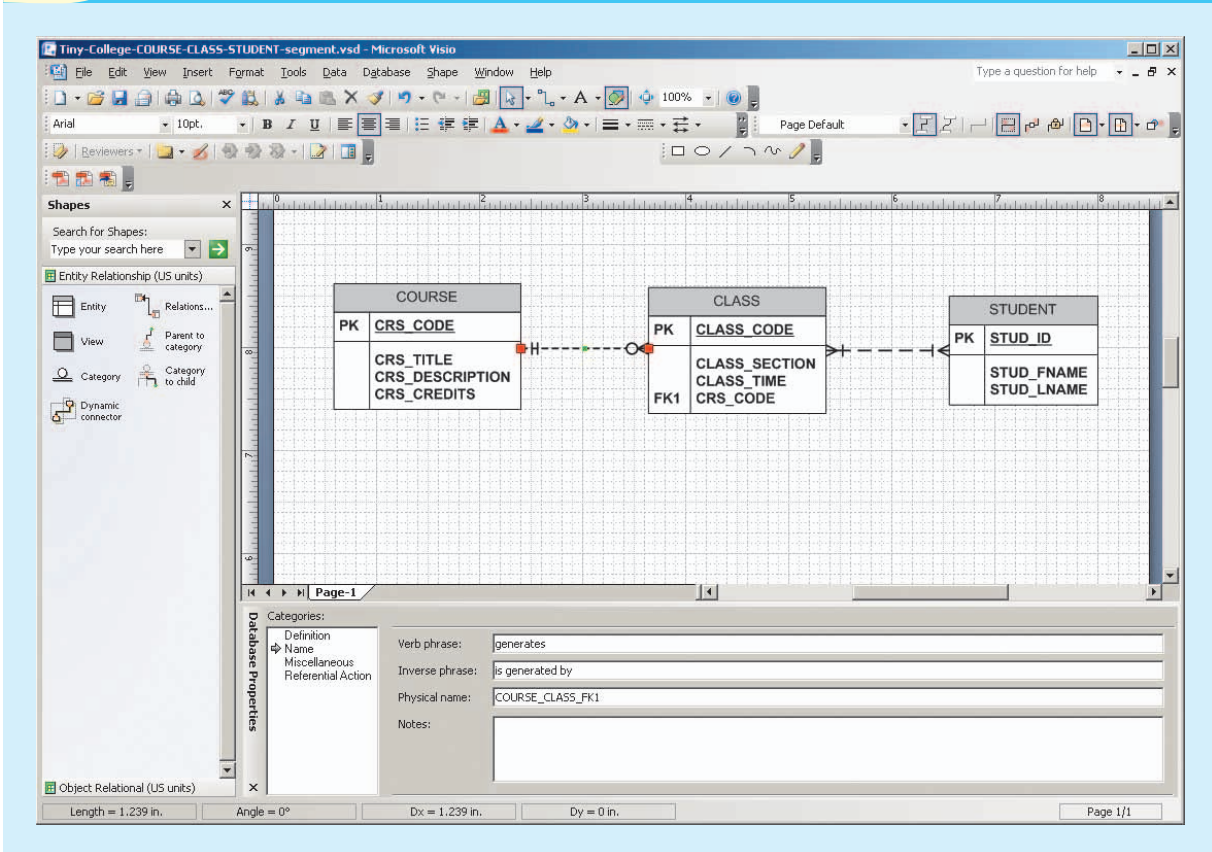


#### A.5.5 SHOWING THE RELATIONSHIP NAMES

As you examine Figure A.34, you may note that the relationship names are not shown. If you *do* want those relationship names shown, click the **Database** option shown at the top of the screen and then select the **Options, Document...** sequence you first saw in Figure A.4.



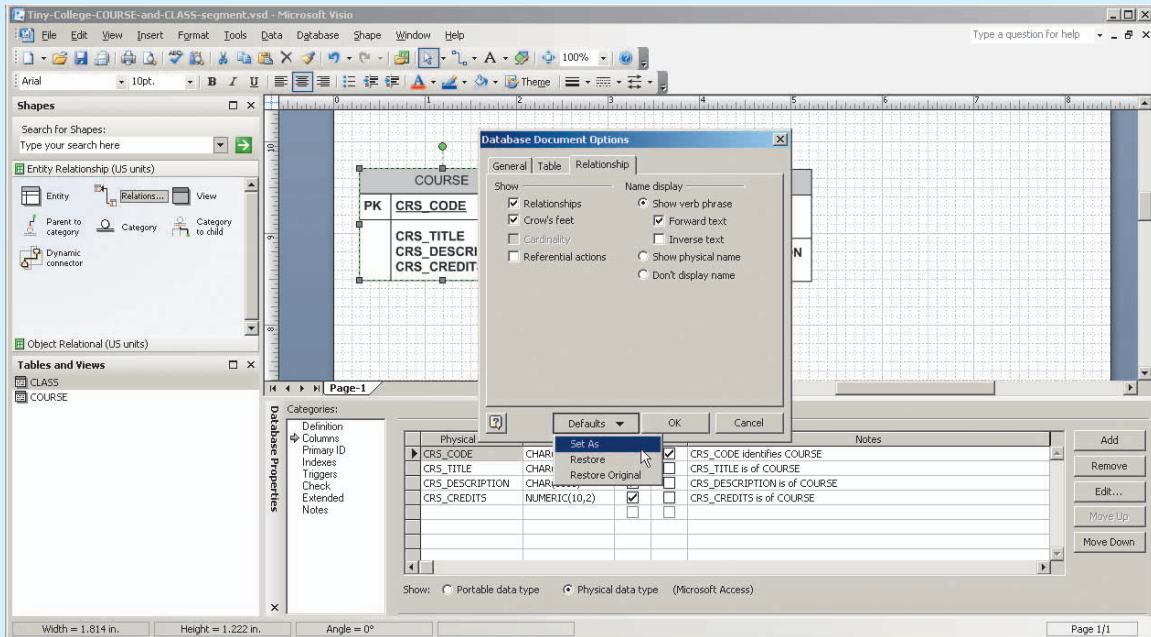
**FIGURE A.34** The named relationship



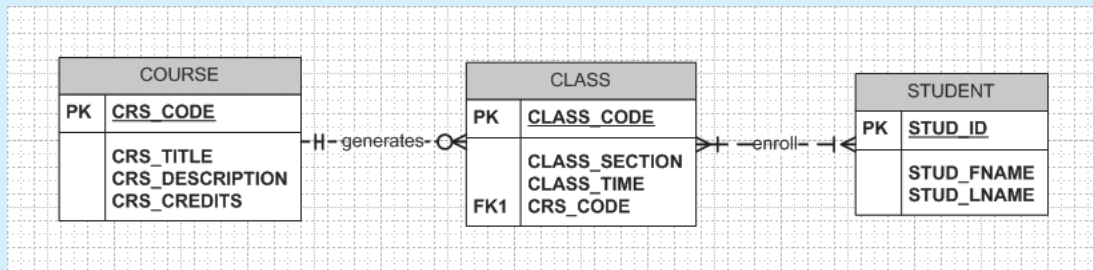
Next, select the database document options **Relationship** tab (see Figure A.35), click the radio button in front of the **Show verb phrase** option, and then select the **Forward text** option. (If you select *both* the **Forward text** and the **Inverse text** options, Visio Professional writes the two relationship names on the same line and separates them with a slash. That option takes more space, so you may have to move the tables farther apart to make the relationship names readable.) Finally, select the **Defaults** option as shown in Figure A.35 and set the selection as the default. (Note that the Database Document Options window has been moved to show you all of the components of this illustration.)

Click **OK** to save the new relationships default shown in Figure A.35 to see all of the relationship names in Figure A.36. For additional practice, try changing the Verb phrase for the relationship between CLASS and STUDENT to “enroll” and the Inverse phrase for that relationship to “is enrolled in”.

**FIGURE A.35** Set the relationship names as the default



**FIGURE A.36** Showing the relationship names



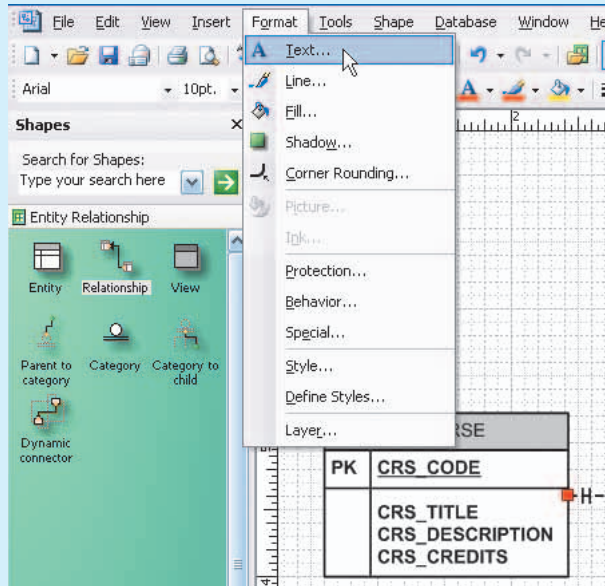
As you can tell by looking at the relationship name in Figure A.36, it is written through the relationship line, thus making it difficult to read. You can change the placement of the relationship name through font control. For example, if you want to place the relationship name above the relationship line, use the **Format, Text...** selection shown in Figure A.37. (Make sure that the relationship line is still selected because you're working on a naming format for the relationship line.)

You may want to save different versions of the ERD to experiment with the various options later. For example, you might want to save the latest modification as **Tiny-College-COURSE-and-CLASS-Segment-Named-Relationship**.

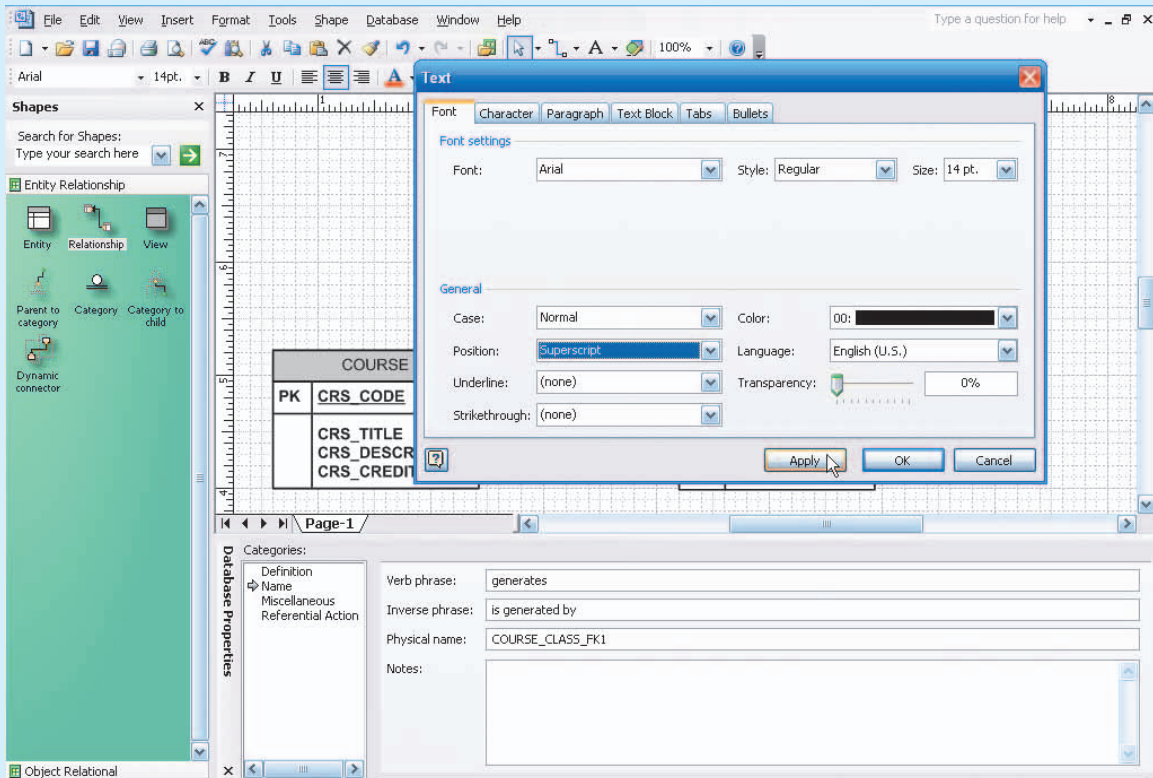
When you click the **Text...** selection shown in Figure A.37, you will see the window in Figure A.38. Note that the **Position:** has been selected to be **Superscript** and the font **Size:** has been selected to be **14 pt**.



**FIGURE A.37** Selecting the relationship name text format

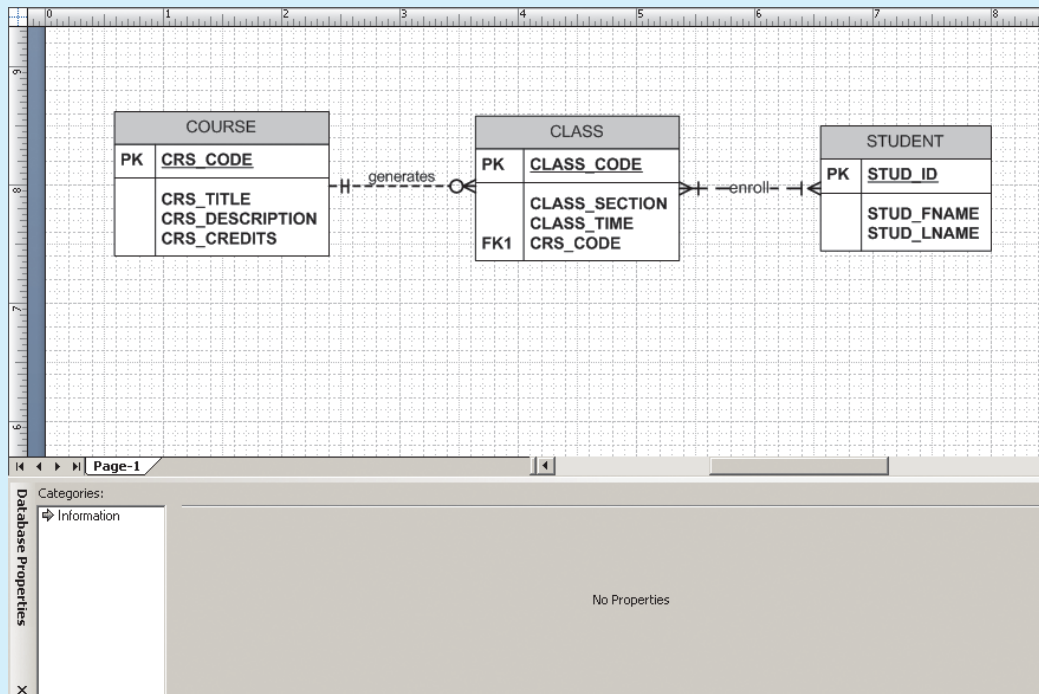


**FIGURE A.38** Repositioning the relationship name



After you have made the selections shown in Figure A.38, click the **Apply** button and then click **OK** to accept the font changes. The relationship name will appear above the relationship line as shown in Figure A.39. (The relationship line has been deselected by clicking an empty portion of the grid to make it easier to read the repositioned relationship name.) For additional practice, reposition the “enroll” relationship name in the same manner.

**FIGURE A.39** The repositioned relationship name



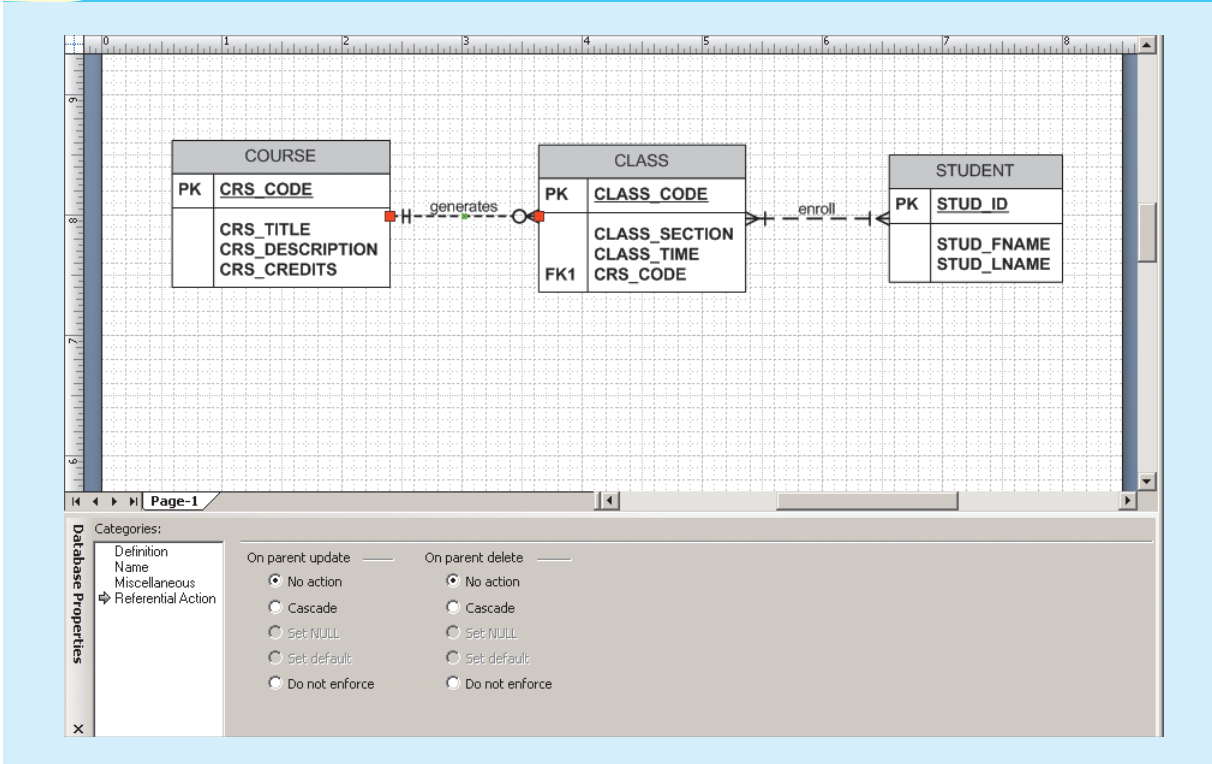
## A.6 REFERENTIAL ACTION

Make sure that the relationship line is still selected. Then click the **Referential Action** option in the **Database Properties** window—look under the **Categories:** header—to produce the results displayed in Figure A.40.

As you examine Figure A.40, it is important to think of the consequences of a deletion in the parent (COURSE) table. For example, if a COURSE is deleted, do you want to delete all of the classes that are associated with that course? That is, do you want to **Cascade** the deletion? (To modify any action, simply click the radio button in front of that action.)

The **Referential Action** selection forces you to make sure that the database design is appropriate to the data environment and that you really do understand the ramification of any database action. Given the many action options shown in Figure A.40, you may want to create a small database and try each action to see its effect.

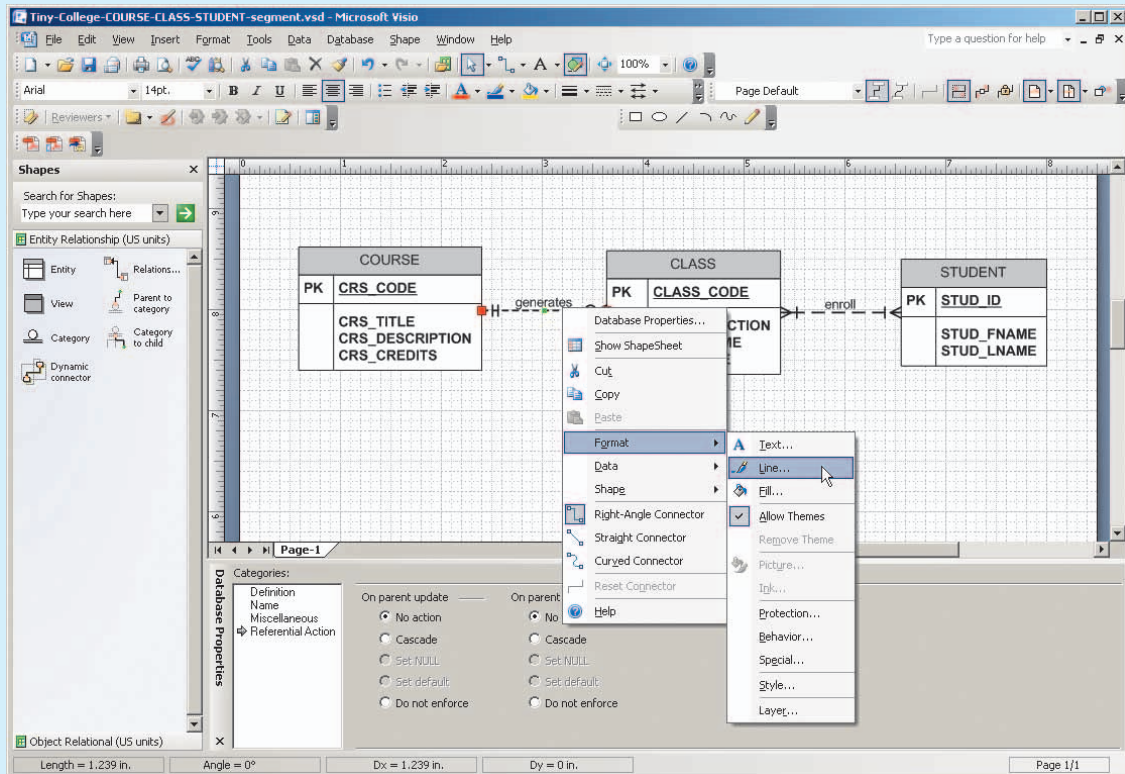
**FIGURE A.40** The default referential action



## A.7 CONTROLLING THE ERD'S PRESENTATION FORMAT

If you want to modify the ERD presentation format, Visio Professional provides many options. For example, if you want to color the relationship lines brown, right-click the relationship line, and then select the **Format, Line...** option shown in Figure A.41. (You can also select the **relationship line** and then select the **Format, Line...** option from the menu bar.)

**FIGURE A.41** Selecting the format option for the relationship line

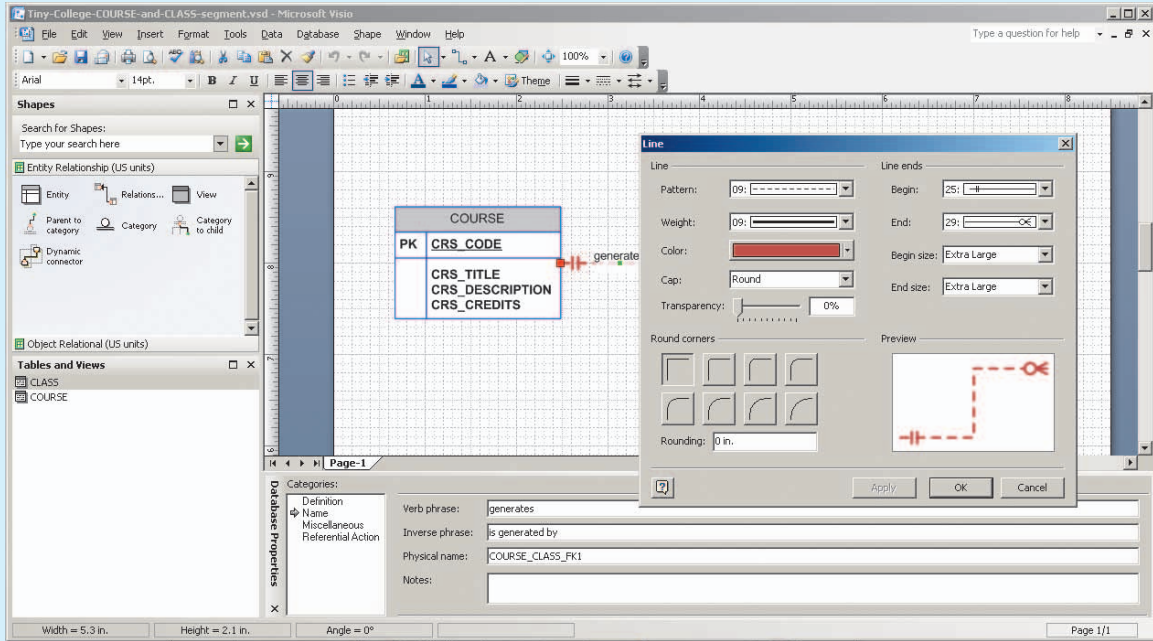


When you select the **Line...** option shown in Figure A.41, you will see the options shown in Figure A.42. Each selection option has its own drop-down list from which to make a selection. Note that the color brown and the line weight **9** have been selected. We have left the remaining options in their default settings. Click the **Apply** button and then click **OK** to accept the format changes shown in Figure A.42. (The formatting changes will take effect as soon as you click the **Apply** button.)

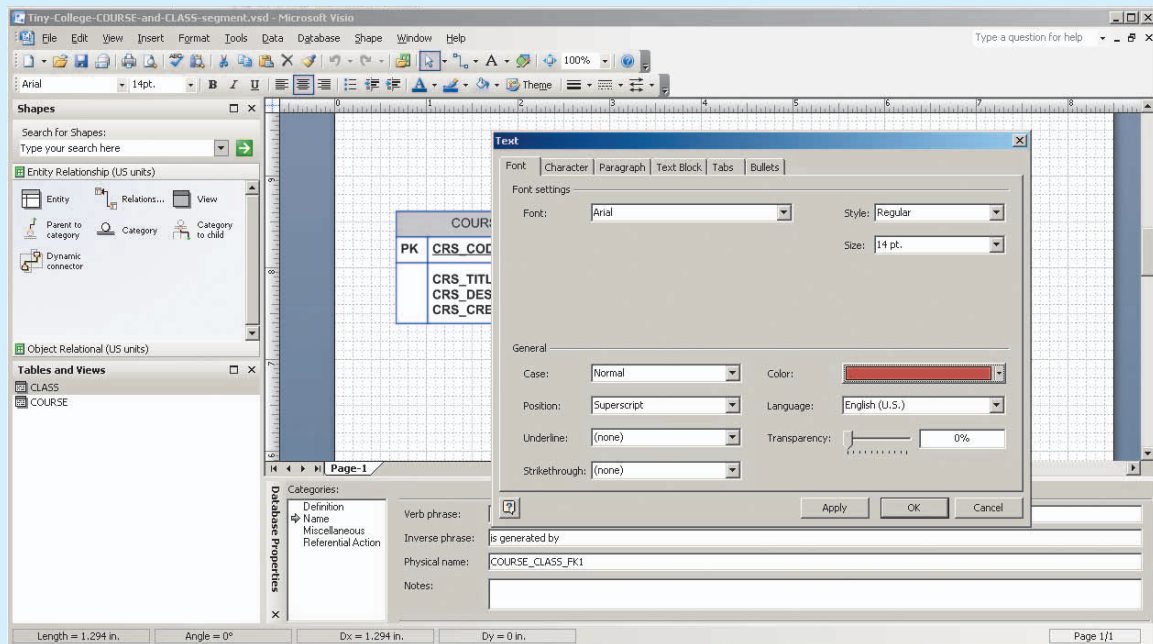
You can format the relationship name's text, too. To do that, select the **Format, Text...** option shown in Figure A.41 to generate the window displayed in Figure A.43. Note the selection of the brown text color to match the color of the relationship line. The font **Size: (14 pt.)** and **Position: (Superscript)** reflect the choices made earlier in Figure A.38. Note (again) that you must click the **Apply** button and then click **OK** to accept the format changes.



**FIGURE A.42** Formatting the relationship line

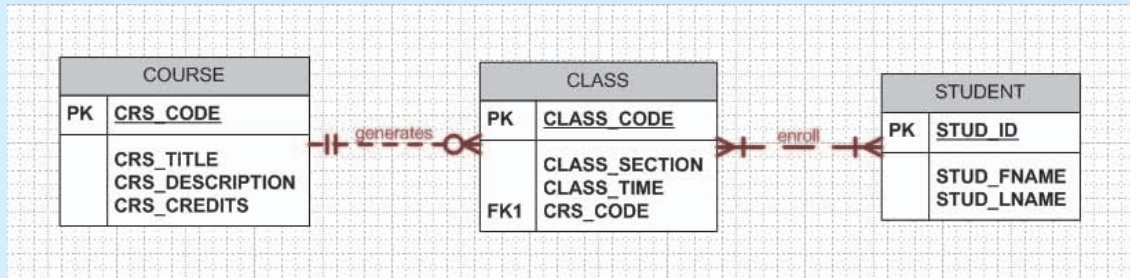


**FIGURE A.43** Formatting the relationship text



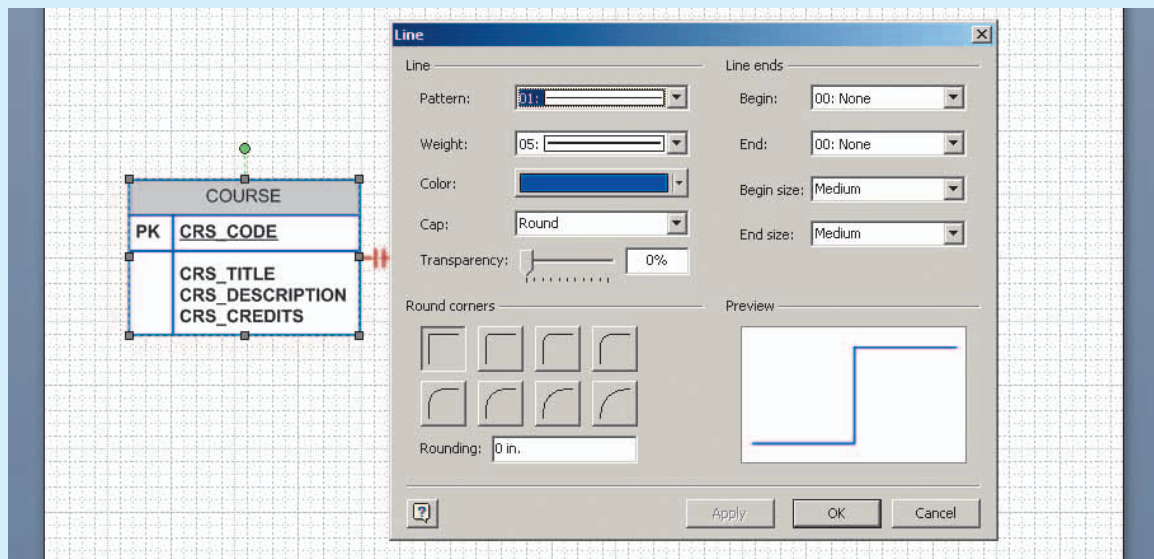
The results of the relationship line and text formatting are shown in Figure A.44. For additional practice, make those same changes to the relationship between CLASS and STUDENT.

**FIGURE A.44** The relationship line and text formatting results



Naturally, you can also control the table's presentation format. To illustrate that process, let's make the table borders blue. To do that, select the table you want to format. Then select the format option (**Format, Line...**) to generate the line options shown in Figure A.45.

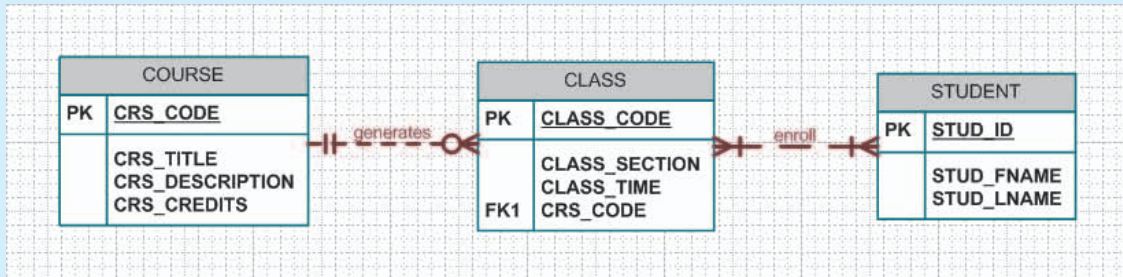
**FIGURE A.45** Formatting the table line



As you examine Figure A.44, note that the line **Color:** was selected to be **4:**, which is blue. The selected line **Weight:** is **5:**. (The higher the line weight value, the thicker the line.) Remember to click the **Apply** button first and then click the **OK** button to save the changes. Now repeat the process for the CLASS and STUDENT tables to produce the results shown in Figure A.46.



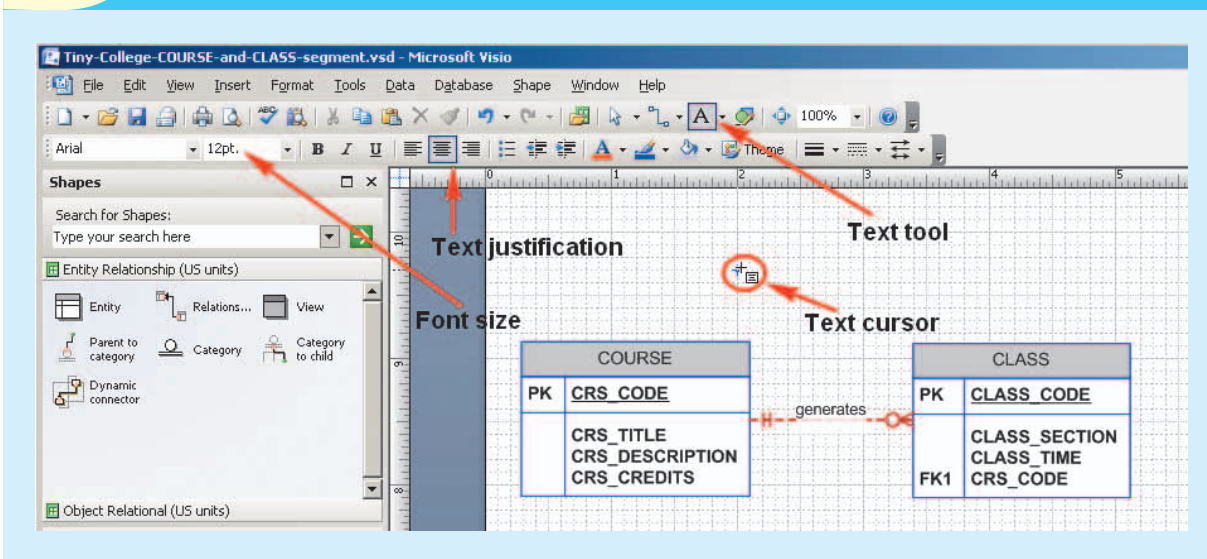
**FIGURE A.46** The reformatted table lines



## A.8 PLACING TEXT ON THE GRID

To help document the ERD, it may be helpful to place explanatory notes on the grid. To produce those notes, select the **Text tool** (maked **A**) shown at the top of the screen. Make sure that you have deselected any tables by clicking a blank area of the screen. You will see the effect of your selection when you note the cursor's new look. Select the text format to suit your needs—center justification and a font size of 12 are shown in Figure A.47.

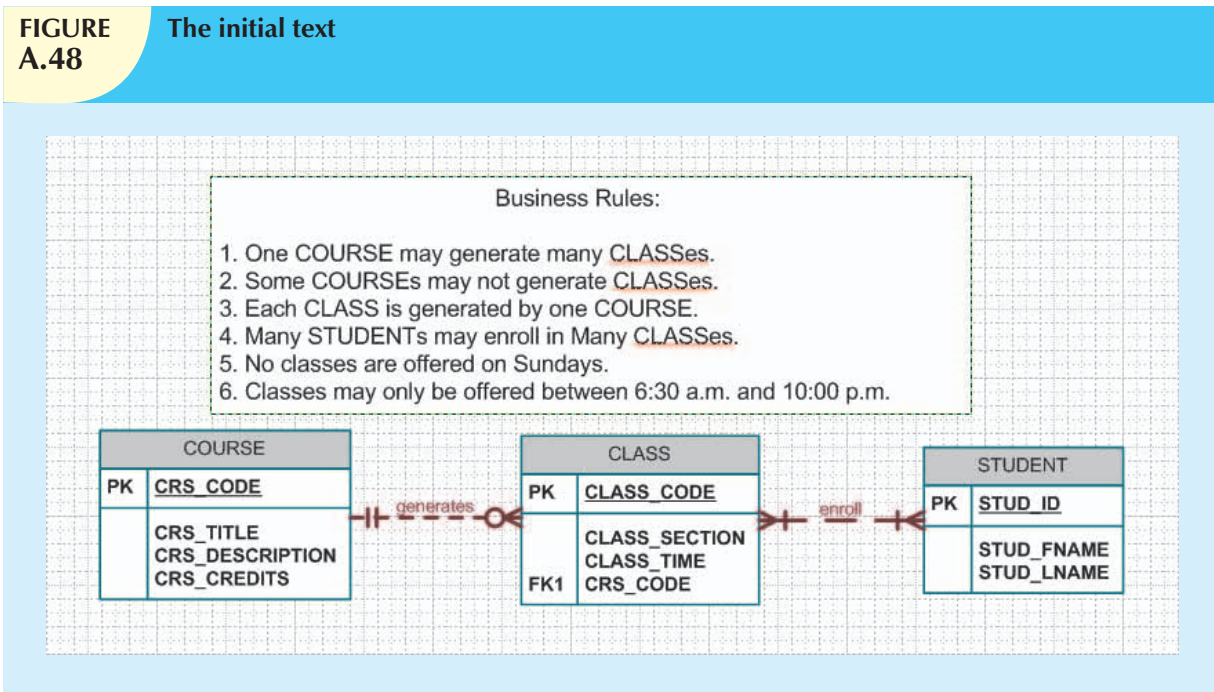
**FIGURE A.47** Selecting the text tool



Change the justification to align left, then type the text shown in Figure A.48. (You can modify any text format such as the font, size, color, and justification later.)

As you examine the text in Figure A.48, you'll notice that there is no space to continue typing the business rules. To make more space, drag and drop the ERD components farther down the screen. (Hold down the **Shift** key as you click each of the two entity boxes and the relationship line to select them, allowing you to move them down together.)

**FIGURE A.48** The initial text



To move the text box, you must first make sure that the text tool has been deselected. If the text tool is still active, click it to deselect it. (You will know that the text tool is active when the cursor looks like the one shown in Figure A.48.) You need to remember two important rules that govern the use of the text box.

1. You cannot move the text box unless the text tool is inactive.
2. You cannot edit the text unless the text tool is active. (In other words, the text tool must be selected before you can create or edit text.)

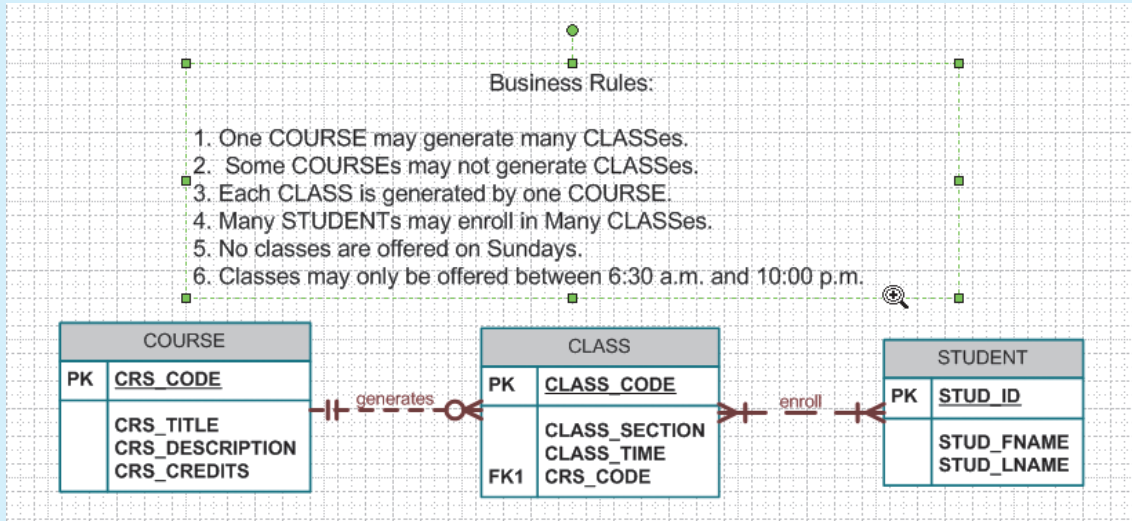
If the text tool is not active, clicking the text box produces a set of small squares (handles) shown on the text box perimeter. You can see the handles around the text box in Figure A.49, which also shows that the ERD has been dragged and dropped farther down the screen. Also note that the four-sided arrow by the cursor indicates that the text box may be moved by dragging and dropping. (If you don't see the four-sided arrow on your screen, move the cursor until the four-sided arrow appears.)

After the text box has been selected as shown in Figure A.49, you can drag and drop it as you would any other object on the screen. In fact, the text box behaves like any other Windows object. For example, you can change the size of the text box by dragging its perimeter to move it in or out. Just place the cursor anywhere along the text box perimeter to produce the two-sided arrow shown in Figure A.50.

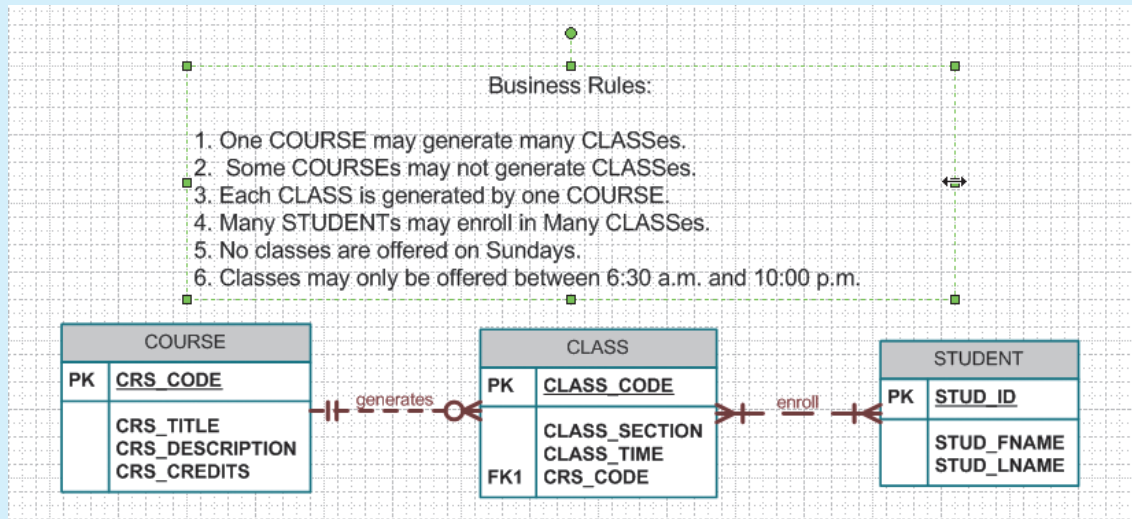
You can now finish typing the text, formatting it to suit your needs. The final text box is shown in Figure A.51. Note that a light blue text color has been selected.

Don't forget to save your Visio file before you exit. As with all Windows applications, you will be reminded to save the file if you try to close it without first saving it.

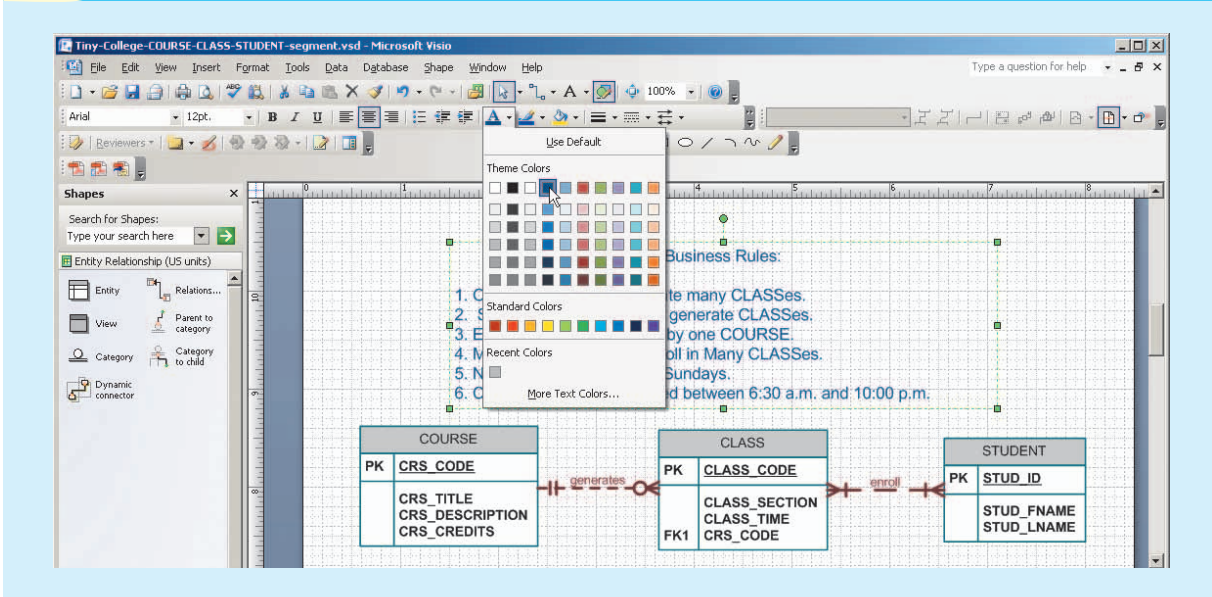
**FIGURE A.49** Selecting the textbox to move it



**FIGURE A.50** Selecting the textbox to size it



**FIGURE A.51** The completed text box



## A.9 USING MS VISIO TO CREATE A SPECIALIZATION HIERARCHY

In this part of the tutorial, you use MS Visio to create the basic specialization hierarchy shown in the text in Figure A.52. Using MS Visio, the supertype and subtypes are created through the use of the three special shapes shown in the following figure.

To create the specialization hierarchy depicted in Figure A.52, do the following:

1. Create the **EMPLOYEE** entity supertype—identify only the common attributes.
2. Create each one of the subtypes (**PILOT**, **MECHANIC**, and **ACCOUNTANT**)—identifying only the unique attributes of each subtype.
3. Add the **Category** shape to your diagram.
4. Use the **Parent to category** shape to connect the **EMPLOYEE** supertype to the category and define the supertype discriminator. In this case, you could also indicate total completeness. However, the default is partial completeness.
5. Use the **Category to child** shape to connect each one of the subtypes to the category. Note that the **EMPLOYEE** FK is automatically added to each one of the subtypes. Make sure that you declare it as the PK of each subtype.
6. Manually add the disjoint/overlapping constraint symbol and subtype discriminator values to the respective category lines for each subtype.

That's it—you are now able to create the supertype and subtype entities you learned about in Chapter 5, Advanced Data Modeling.



**FIGURE A.52** MS Visio supertype / subtype modeling symbols

