

Міністерство освіти і науки України  
НТУУ «КПІ ім. Ігоря Сікорського»  
Навчально-науковий інститут атомної та теплової енергетики  
Кафедра цифрових технологій в енергетиці

## Лабораторна робота №5

з дисципліни «Декларативне програмування графічних  
інтерфейсів»

«Модель "сутність-зв'язок" та її використання для організації  
роботи з базою даних»

Варіант №19

Виконав: Студент групи ТР-12

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Перевірив: доцент, к.ф.-м.н.

Тарнавський Ю. А.

**Мета роботи.** Розробити програму для керування даними, що зберігаються в SQL-базі даних.

## **Завдання 1: Створення моделі даних**

**Скрипт для створення бази даних та таблиць:**

```
CREATE DATABASE DPGI
GO;

USE DPGI
GO;

CREATE TABLE dbo.Publishers
(
    id INT IDENTITY (1, 1),
    name VARCHAR(255) NOT NULL,

    PRIMARY KEY (id)
)
GO;

CREATE TABLE dbo.Books
(
    isbn VARCHAR(30) NOT NULL,
    title VARCHAR(255) NOT NULL,
    authors VARCHAR(255) NOT NULL,
    publisher_code INT NOT NULL,
    publication_year SMALLINT,

    PRIMARY KEY (isbn),

    CONSTRAINT FK_PublishersCode
        FOREIGN KEY (publisher_code) REFERENCES dbo.Publishers (id)
)
GO;
```

**Скрипт для вставки даних:**

```
USE DPGI
GO;

DROP TABLE IF EXISTS #BulkData
GO;

CREATE TABLE #BulkData
(
    isbn VARCHAR(30),
    title VARCHAR(255),
    authors VARCHAR(255),
    publisher VARCHAR(255),
    publication_year SMALLINT
)
GO;

BULK INSERT #BulkData
FROM 'D:\Programming\KPI-DPGI\Lab5\Database\Data\Data.csv'
WITH (
    FIELDTERMINATOR = ',',
    ROWTERMINATOR = '\n',
    FIRSTROW = 2
);

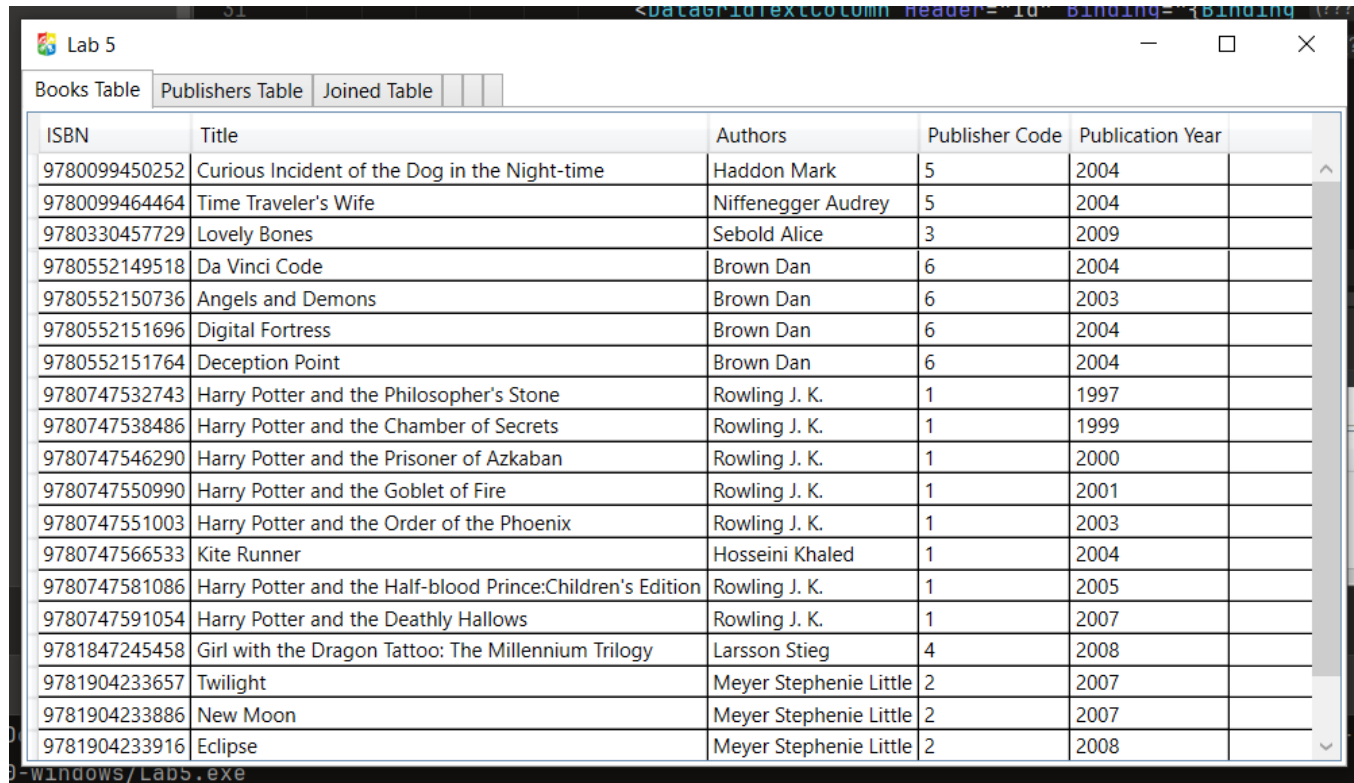
INSERT INTO dbo.Publishers (name)
SELECT DISTINCT publisher
FROM #BulkData
GO;

INSERT INTO dbo.Books (isbn, title, authors, publication_year, publisher_code)
SELECT bd.isbn,
    bd.title,
    bd.authors,
    bd.publication_year,
    pub.id AS publisher_code
FROM #BulkData AS bd
INNER JOIN dbo.Publishers AS pub
ON bd.publisher = pub.name;
```

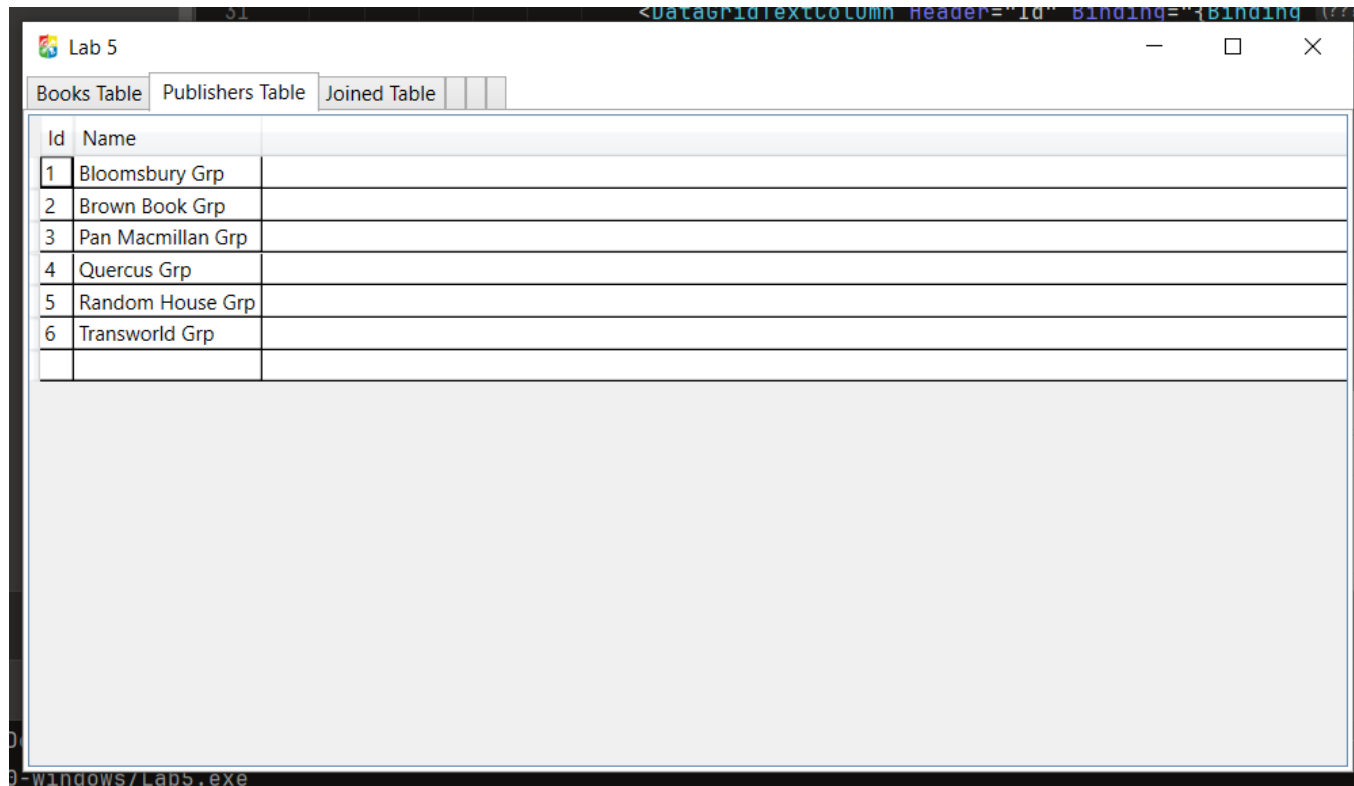
```
DROP TABLE IF EXISTS #BulkData
GO;
```

## Завдання 2: Створення моделі

### Скріншоти:



ISBN	Title	Authors	Publisher Code	Publication Year	
9780099450252	Curious Incident of the Dog in the Night-time	Haddon Mark	5	2004	
9780099464464	Time Traveler's Wife	Niffenegger Audrey	5	2004	
9780330457729	Lovely Bones	Sebold Alice	3	2009	
9780552149518	Da Vinci Code	Brown Dan	6	2004	
9780552150736	Angels and Demons	Brown Dan	6	2003	
9780552151696	Digital Fortress	Brown Dan	6	2004	
9780552151764	Deception Point	Brown Dan	6	2004	
9780747532743	Harry Potter and the Philosopher's Stone	Rowling J. K.	1	1997	
9780747538486	Harry Potter and the Chamber of Secrets	Rowling J. K.	1	1999	
9780747546290	Harry Potter and the Prisoner of Azkaban	Rowling J. K.	1	2000	
9780747550990	Harry Potter and the Goblet of Fire	Rowling J. K.	1	2001	
9780747551003	Harry Potter and the Order of the Phoenix	Rowling J. K.	1	2003	
9780747566533	Kite Runner	Hosseini Khaled	1	2004	
9780747581086	Harry Potter and the Half-blood Prince: Children's Edition	Rowling J. K.	1	2005	
9780747591054	Harry Potter and the Deathly Hallows	Rowling J. K.	1	2007	
9781847245458	Girl with the Dragon Tattoo: The Millennium Trilogy	Larsson Stieg	4	2008	
9781904233657	Twilight	Meyer Stephenie Little	2	2007	
9781904233886	New Moon	Meyer Stephenie Little	2	2007	
9781904233916	Eclipse	Meyer Stephenie Little	2	2008	



Id	Name	
1	Bloomsbury Grp	
2	Brown Book Grp	
3	Pan Macmillan Grp	
4	Quercus Grp	
5	Random House Grp	
6	Transworld Grp	

### Завдання 3: Створення запитів до Entity Framework

Об'єднана таблиця:

Lab 5

Books Table Publishers Table Joined Table Search | Books Search | By Publisher

Isbn	Title	Authors	Publisher	PublicationYear	
9780099450252	Curious Incident of the Dog in the Night-time	Haddon Mark	Random House Grp	2004	
9780099464464	Time Traveler's Wife	Niffenegger Audrey	Random House Grp	2004	
9780330457729	Lovely Bones	Sebold Alice	Pan Macmillan Grp	2009	
9780552149518	Da Vinci Code	Brown Dan	Transworld Grp	2004	
9780552150736	Angels and Demons	Brown Dan	Transworld Grp	2003	
9780552151696	Digital Fortress	Brown Dan	Transworld Grp	2004	
9780552151764	Deception Point	Brown Dan	Transworld Grp	2004	
9780747532743	Harry Potter and the Philosopher's Stone	Rowling J. K.	Bloomsbury Grp	1997	
9780747538486	Harry Potter and the Chamber of Secrets	Rowling J. K.	Bloomsbury Grp	1999	
9780747546290	Harry Potter and the Prisoner of Azkaban	Rowling J. K.	Bloomsbury Grp	2000	
9780747550990	Harry Potter and the Goblet of Fire	Rowling J. K.	Bloomsbury Grp	2001	
9780747551003	Harry Potter and the Order of the Phoenix	Rowling J. K.	Bloomsbury Grp	2003	
9780747566533	Kite Runner	Hosseini Khaled	Bloomsbury Grp	2004	
9780747581086	Harry Potter and the Half-blood Prince:Children's Edition	Rowling J. K.	Bloomsbury Grp	2005	
9780747591054	Harry Potter and the Deathly Hallows	Rowling J. K.	Bloomsbury Grp	2007	
9781847245458	Girl with the Dragon Tattoo: The Millennium Trilogy	Larsson Stieg	Quercus Grp	2008	
9781904233657	Twilight	Meyer Stephenie Little	Brown Book Grp	2007	
9781904233886	New Moon	Meyer Stephenie Little	Brown Book Grp	2007	
9781904233916	Eclipse	Meyer Stephenie Little	Brown Book Grp	2008	

Пошук книжок за всіма полями:

Lab 5

Books Table Publishers Table Joined Table Search | Books Search | By Publisher

ISBN:

Title:

Authors:

Publisher:

Publication Year:

Har

ISBN	Title	Authors	Publisher Code	Publication Year	
9780747532743	Harry Potter and the Philosopher's Stone	Rowling J. K.	1	1997	
9780747538486	Harry Potter and the Chamber of Secrets	Rowling J. K.	1	1999	
9780747546290	Harry Potter and the Prisoner of Azkaban	Rowling J. K.	1	2000	
9780747550990	Harry Potter and the Goblet of Fire	Rowling J. K.	1	2001	
9780747551003	Harry Potter and the Order of the Phoenix	Rowling J. K.	1	2003	
9780747581086	Harry Potter and the Half-blood Prince:Children's Edition	Rowling J. K.	1	2005	
9780747591054	Harry Potter and the Deathly Hallows	Rowling J. K.	1	2007	

Пошук книжок в об'єднаній таблиці за видавництвом:

Lab 5

Books Table Publishers Table Joined Table Search | Books Search | By Publisher

Publisher: Tr

Isbn	Title	Authors	Publisher	PublicationYear	
9780552149518	Da Vinci Code	Brown Dan	Transworld Grp	2004	
9780552150736	Angels and Demons	Brown Dan	Transworld Grp	2003	
9780552151696	Digital Fortress	Brown Dan	Transworld Grp	2004	
9780552151764	Deception Point	Brown Dan	Transworld Grp	2004	

**Висновок:** за результатами виконання цієї лабораторної роботи були набуті практичні навички роботи з Entity Framework.

## Код програми.

### *MainWindow.xaml:*

```
<Window x:Class="Lab5.Views.MainWindow"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
        xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
        xmlns:local="clr-namespace:Lab5.Views"
        mc:Ignorable="d"
        WindowStartupLocation="CenterScreen"
        Title="Lab 5" MinHeight="450" Height="450" MinWidth="800" Width="800">
    <Grid>
        <TabControl>
            <TabItem Header="Books Table">
                <DataGrid x:Name="BooksGrid"
                    AutoGenerateColumns="False"
                    ItemsSource="{Binding}">
                    <DataGrid.Columns>
                        <DataGridTextColumn Header="ISBN" Binding="{Binding Isbn}" />
                        <DataGridTextColumn Header="Title" Binding="{Binding Title}" />
                        <DataGridTextColumn Header="Authors" Binding="{Binding Authors}" />
                        <DataGridTextColumn Header="Publisher Code" Binding="{Binding PublisherCode}"
/>
                        <DataGridTextColumn Header="Publication Year" Binding="{Binding
PublicationYear}" />
                    </DataGrid.Columns>
                </DataGrid>
            </TabItem>

            <TabItem Header="Publishers Table">
                <DataGrid x:Name="PublishersGrid"
                    AutoGenerateColumns="False"
                    ItemsSource="{Binding}">
                    <DataGrid.Columns>
                        <DataGridTextColumn Header="Id" Binding="{Binding Id}" />
                        <DataGridTextColumn Header="Name" Binding="{Binding Name}" />
                    </DataGrid.Columns>
                </DataGrid>
            </TabItem>

            <TabItem Header="Joined Table">
                <DataGrid x:Name="JoinedGrid"
                    AutoGenerateColumns="True"
                    ItemsSource="{Binding}">
                </DataGrid>
            </TabItem>

            <TabItem Header="Search | Books">
                <Grid>
                    <Grid.ColumnDefinitions>
                        <ColumnDefinition Width="Auto" />
                        <ColumnDefinition />
                    </Grid.ColumnDefinitions>
                    <Grid.RowDefinitions>
                        <RowDefinition Height="Auto" />
                        <RowDefinition Height="Auto" />
                        <RowDefinition Height="Auto" />
                        <RowDefinition Height="Auto" />
                        <RowDefinition Height="Auto" />
                        <RowDefinition Height="*" />
                    </Grid.RowDefinitions>

                    <TextBlock Grid.Row="0" Grid.Column="0" Margin="5">ISBN:</TextBlock>
                    <TextBox x:Name="IsbnBox"
                        TextChanged="SearchBooksTextChanged"
                        Grid.Row="0" Grid.Column="1"
                        Focusable="True" />

                    <TextBlock Grid.Row="1" Grid.Column="0" Margin="5">Title:</TextBlock>
                    <TextBox x:Name="TitleBox"
                        TextChanged="SearchBooksTextChanged"
                        Grid.Row="1" Grid.Column="1"
                        Focusable="True" />
                </Grid>
            </TabItem>
        </TabControl>
    </Grid>
</Window>
```

```

        <TextBlock Grid.Row="2" Grid.Column="0" Margin="5">Authors:</TextBlock>
        <TextBox x:Name="AuthorsBox"
            TextChanged="SearchBooksTextChanged"
            Grid.Row="2" Grid.Column="1"
            Focusable="True" />

        <TextBlock Grid.Row="3" Grid.Column="0" Margin="5">Publisher:</TextBlock>
        <TextBox x:Name="PublisherCodeBox"
            TextChanged="SearchBooksTextChanged"
            PreviewTextInput="NumberValidationTextBox"
            Grid.Row="3" Grid.Column="1"
            Focusable="True" />

        <TextBlock Grid.Row="4" Grid.Column="0" Margin="5">Publication Year:</TextBlock>
        <TextBox x:Name="PublicationYearBox"
            TextChanged="SearchBooksTextChanged"
            PreviewTextInput="NumberValidationTextBox"
            Grid.Row="4" Grid.Column="1"
            Focusable="True" />

        <DataGrid Grid.Row="5" Grid.Column="0" Grid.ColumnSpan="2"
            x:Name="SearchBooksGrid"
            AutoGenerateColumns="False"
            ItemsSource="{Binding}">
            <DataGrid.Columns>
                <DataGridTextColumn Header="ISBN" Binding="{Binding Isbn}" />
                <DataGridTextColumn Header="Title" Binding="{Binding Title}" />
                <DataGridTextColumn Header="Authors" Binding="{Binding Authors}" />
                <DataGridTextColumn Header="Publisher Code" Binding="{Binding
PublisherCode}" />
                <DataGridTextColumn Header="Publication Year" Binding="{Binding
PublicationYear}" />
            </DataGrid.Columns>
        </DataGrid>
    </Grid>
</TabItem>

<TabItem Header="Search | By Publisher">
    <Grid>
        <Grid.ColumnDefinitions>
            <ColumnDefinition Width="Auto" />
            <ColumnDefinition />
        </Grid.ColumnDefinitions>
        <Grid.RowDefinitions>
            <RowDefinition Height="Auto" />
            <RowDefinition Height="*" />
        </Grid.RowDefinitions>

        <TextBlock Grid.Row="0" Grid.Column="0" Margin="5">Publisher:</TextBlock>
        <TextBox x:Name="PublisherSearchBox"
            TextChanged="SearchByPublisher"
            Grid.Row="0" Grid.Column="1"
            Focusable="True" />

        <DataGrid Grid.Row="1" Grid.Column="0" Grid.ColumnSpan="2"
            x:Name="SearchByPublisherGrid"
            AutoGenerateColumns="True"
            ItemsSource="{Binding}">
        </DataGrid>
    </Grid>
</TabItem>
</TabControl>
</Grid>
</Window>

```

### *MainWindow.xaml.cs:*

```

using System.Text.RegularExpressions;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Input;
using Lab5.Context;
using Lab5.Entities;
using LinqKit;
using Microsoft.IdentityModel.Tokens;

namespace Lab5.Views;

/// <summary>
/// Interaction logic for MainWindow.xaml

```

```

/// </summary>
public partial class MainWindow : Window
{
    public MainWindow()
    {
        InitializeComponent();

        using var dbContext = new LibraryDbContext();
        BooksGrid.DataContext = dbContext.Books.ToList();
        PublishersGrid.DataContext = dbContext.Publishers.ToList();

        InitializeJoinedTable(dbContext);
    }

    private void InitializeJoinedTable(LibraryDbContext dbContext)
    {
        var joined = dbContext.Books.Join(dbContext.Publishers,
            x => x.PublisherCode,
            y => y.Id,
            (x, y) => new
            {
                x.Isbn,
                x.Title,
                x.Authors,
                Publisher = y.Name,
                x.PublicationYear
            });

        JoinedGrid.DataContext = joined.ToList();
    }

    private void SearchBooksTextChanged(object sender, TextChangedEventArgs e)
    {
        using var dbContext = new LibraryDbContext();

        var isbn = IsbnBox.Text.Trim();
        var title = TitleBox.Text.Trim();
        var authors = AuthorsBox.Text.Trim();
        var code = Convert.ToDecimal(ZeroIfEmpty(PublisherCodeBox.Text.Trim()));
        var year = Convert.ToDecimal(ZeroIfEmpty(PublicationYearBox.Text.Trim()));

        var predicate = PredicateBuilder.New<Book>();

        if (!isbn.IsNullOrEmpty()) predicate.And(b => b.Isbn.Contains(isbn));
        if (!title.IsNullOrEmpty()) predicate.And(b => b.Title.Contains(title));
        if (!authors.IsNullOrEmpty()) predicate.And(b => b.Authors.Contains(authors));
        if (code != 0) predicate.And(b => b.PublisherCode == code);
        if (year != 0) predicate.And(b => b.PublicationYear == year);

        SearchBooksGrid.DataContext = dbContext.Books.Where(predicate).ToList();
    }

    private void SearchByPublisher(object sender, TextChangedEventArgs e)
    {
        using var dbContext = new LibraryDbContext();

        var publisher = PublisherSearchBox.Text.Trim();

        var joined = dbContext.Books.Join(dbContext.Publishers,
            x => x.PublisherCode,
            y => y.Id,
            (x, y) => new
            {
                x.Isbn,
                x.Title,
                x.Authors,
                Publisher = y.Name,
                x.PublicationYear
            });

        SearchByPublisherGrid.DataContext = joined
            .Where(b => b.Publisher.Contains(publisher))
            .ToList();
    }

    private static string ZeroIfEmpty(string s)
    {
        return string.IsNullOrEmpty(s) ? "0" : s;
    }

    private void NumberValidationTextBox(object sender, TextCompositionEventArgs e)

```

```

    {
        var regex = new Regex("[^0-9]+");
        e.Handled = regex.IsMatch(e.Text);
    }
}

```

### *CreateTable.sql:*

```

CREATE DATABASE DPGI
GO;

USE DPGI
GO;

CREATE TABLE dbo.Publishers
(
    id INT IDENTITY (1, 1),
    name VARCHAR(255) NOT NULL,

    PRIMARY KEY (id)
)
GO;

CREATE TABLE dbo.Books
(
    isbn VARCHAR(30) NOT NULL,
    title VARCHAR(255) NOT NULL,
    authors VARCHAR(255) NOT NULL,
    publisher_code INT NOT NULL,
    publication_year SMALLINT,

    PRIMARY KEY (isbn),

    CONSTRAINT FK_PublishersCode
        FOREIGN KEY (publisher_code) REFERENCES dbo.Publishers (id)
)
GO;

```

### *InsertData.sql:*

```

USE DPGI
GO;

DROP TABLE IF EXISTS #BulkData
GO;

CREATE TABLE #BulkData
(
    isbn VARCHAR(30),
    title VARCHAR(255),
    authors VARCHAR(255),
    publisher VARCHAR(255),
    publication_year SMALLINT
)
GO;

BULK INSERT #BulkData
FROM 'D:\Programming\KPI-DPGI\Lab5\Database\Data\Data.csv'
WITH (
    FIELDTERMINATOR = ',',
    ROWTERMINATOR = '\n',
    FIRSTROW = 2
);

INSERT INTO dbo.Publishers (name)
SELECT DISTINCT publisher
FROM #BulkData
GO;

INSERT INTO dbo.Books (isbn, title, authors, publication_year, publisher_code)
SELECT bd.isbn,
    bd.title,
    bd.authors,
    bd.publication_year,
    pub.id AS publisher_code
FROM #BulkData AS bd
INNER JOIN dbo.Publishers AS pub
ON bd.publisher = pub.name;

DROP TABLE IF EXISTS #BulkData
GO;

```