

## Azure SQL Database

### ♦ What is Azure SQL Database?

- Azure SQL Database is a **fully managed relational database service** on Microsoft Azure.
  - It's built on the latest version of **Microsoft SQL Server engine**, but you don't need to worry about installation, patching, or infrastructure management — Azure handles that for you.
  - You can use it for **OLTP (transactional)**, **OLAP (analytics)**, or **mixed workloads**.
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### ♦ Key Features

1. **Fully Managed (PaaS)** – No server maintenance, backups, or patching needed.
2. **High Availability** – Built-in replicas ensure **99.99% uptime SLA**.
3. **Scalability** – Scale up/down based on workload:
  - **DTU Model** (Database Transaction Unit – bundled CPU, memory, IOPS).
  - **vCore Model** (choose compute + storage independently).
4. **Security** – Advanced threat protection, encryption (TDE), firewall rules, Azure AD authentication.
5. **Backup & Restore** – Automated backups (point-in-time restore up to 35 days).

6. **Geo-Replication** – Create readable secondaries in other regions for disaster recovery.
  7. **Integration** – Works seamlessly with Power BI, Azure Functions, Logic Apps, and more.
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#### ♦ **Deployment Models**

1. **Single Database** – One isolated database, best for small apps.
  2. **Elastic Pool** – Share resources among multiple databases.
  3. **Managed Instance** – Almost full SQL Server compatibility, ideal for lift-and-shift from on-prem.
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#### **Lab: Deploy & Use Azure SQL Database**

 **Objective:** Create an Azure SQL Database, connect to it, and run queries.

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#### **Step 1: Create Azure SQL Database**

1. Log in to **Azure Portal** → <https://portal.azure.com>
2. Search “**SQL Database**” → Click **Create**.
3. Fill in details:

- **Subscription:** Your Azure subscription
  - **Resource Group:** **RG-SQL-Lab** (create new)
  - **Database Name:** **StudentDB**
  - **Server:** Create new → **student-sqlserver**
    - Server admin login: **sqladmin**
    - Password: **YourStrongPassword123!**
  - **Compute + Storage:** Start with **Basic (DTU model)** or **General Purpose (vCore)**
  - Leave other defaults → Click **Review + Create** → **Create**
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## Step 2: Configure Firewall Rules

- Go to the created **SQL Server (student-sqlserver)** → Settings → **Networking**
  - Add client IP (your system's public IP).
  - Save → Now you can connect from your machine.
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## Step 3: Connect to SQL Database

You can connect using:

- **Azure Data Studio**
- **SQL Server Management Studio (SSMS)**
- Or from the **Azure Query Editor (Preview)** inside the portal

👉 Example using **Azure Query Editor**:

1. Open SQL Database → Query Editor.
2. Login with **sqladmin** and password.
3. Run queries:

-- Create a table

```
CREATE TABLE Students (  
    StudentID INT PRIMARY KEY,  
    Name NVARCHAR(50),  
    Course NVARCHAR(50),  
    Marks INT  
);
```

-- Insert records

```
INSERT INTO Students (StudentID, Name, Course, Marks)  
VALUES (1, 'Alice', 'Azure Fundamentals', 85),  
       (2, 'Bob', 'AWS Basics', 90),  
       (3, 'Charlie', 'DevOps Intro', 78);
```

-- Fetch data

```
SELECT * FROM Students;
```

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#### Step 4: Test Scaling

- Go to your SQL Database → **Compute + Storage**
  - Change performance tier (Basic → Standard → Premium).
  - Notice how you can scale without downtime.
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#### Step 5: Explore Security

- Enable **Transparent Data Encryption (TDE)** (default ON).
  - Configure **Auditing & Threat Protection** from Security tab.
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✅ **End Result:** You've created a managed Azure SQL Database, inserted and queried data, scaled performance, and explored security features.

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