

ODBC Programming 3

Database (Spring 2023)

ODBC Programming : Create Example Tables

(same example as in
ODBC Programming 2)

```
SQLQuery1.sql - ...OMPANY (KIM (77))* ×
CREATE TABLE DEPARTMENT(
    DEPTNO INT NOT NULL,
    DEPTNAME CHAR(20),
    FLOOR INT,
    PRIMARY KEY(DEPTNO)
);

INSERT INTO DEPARTMENT VALUES(1, 'SALES', 8);
INSERT INTO DEPARTMENT VALUES(2, 'PLANNING', 10);
INSERT INTO DEPARTMENT VALUES(3, 'DEVELOPMENT', 9);
INSERT INTO DEPARTMENT VALUES(4, 'GENERAL AFFAIRS', 7);
INSERT INTO DEPARTMENT VALUES(5, 'RESEARCH', 11);
```

Create the DEPARTMENT table

ODBC Programming : Create Example Tables

(same example as in
ODBC Programming 2)

```
SQLQuery1.sql -...OMPANY (KIM (77)) *  X
CREATE TABLE EMPLOYEE(
    EMPNO INTEGER NOT NULL,
    EMPNAME CHAR(10) UNIQUE,
    TITLE CHAR(20) DEFAULT 'STAFF',
    MANAGER INTEGER,
    SALARY INTEGER CHECK(SALARY<6000000),
    DNO INTEGER CHECK(DNO IN(1,2,3,4)) DEFAULT 1,
    PRIMARY KEY(EMPNO),
    FOREIGN KEY(MANAGER) REFERENCES EMPLOYEE(EMPNO),
    FOREIGN KEY(DNO) REFERENCES DEPARTMENT(DEPTNO)
);

INSERT INTO EMPLOYEE VALUES(4377, 'L.LEE', 'PRESIDENT', NULL, 5000000, 2);
INSERT INTO EMPLOYEE VALUES(3426, 'Y.PARK', 'MANAGER', 4377, 3000000, 1);
INSERT INTO EMPLOYEE VALUES(3011, 'S.LEE', 'GENERAL MANAGER', 4377, 4000000, 3);
INSERT INTO EMPLOYEE VALUES(3427, 'J.CHOI', 'STAFF', 3011, 1500000, 3);
INSERT INTO EMPLOYEE VALUES(1003, 'M.CHO', 'MANAGER', 4377, 3000000, 2);
INSERT INTO EMPLOYEE VALUES(2106, 'C.KIM', 'ASSISTANT MANAGER', 1003, 2500000, 2);
INSERT INTO EMPLOYEE VALUES(1365, 'S.KIM', 'STAFF', 3426, 1500000, 1);
INSERT INTO EMPLOYEE VALUES(1782, 'S.JEROME', 'STAFF', 3426, 3500000, 3);
```

Create the EMPLOYEE table


ODBC Programming : INSERT Example 1

```
56 int main(int argc, char *argv[])
57 {
58     if (db_connect())
59     {
60         printf("Connected to %s!\n\n", dataSourceName);
61
62         SQLHSTMT hStmt; // Statement Handle
63         SQLCHAR query[101];
64
65         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
66         {
67             sprintf_s((char *)query, 101, "INSERT INTO EMPLOYEE VALUES(1782, 'S.JEROME', 'STAFF', 3426,3500000, 3)");
68             if (SQLExecDirect(hStmt, query, SQL_NTS) == SQL_ERROR)
69             {
70                 SQLCHAR buffer[SQL_MAX_MESSAGE_LENGTH + 1];
71                 SQLCHAR sqlstate[SQL_SQLSTATE_SIZE + 1];
72                 SQLINTEGER sqlcode;
73                 SQLSMALLINT length;
74                 SQLError(hEnv, hDbc, hStmt, sqlstate, &sqlcode, buffer, SQL_MAX_MESSAGE_LENGTH + 1, &length);
75                 printf("SQLSTATE %s\n", sqlstate);
76                 printf("Native error code:%ld\n", sqlcode);
77                 printf("%s\n\n", buffer);
78             }
79
80             SQLCloseCursor(hStmt);
81             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
82         }
83
84         db_disconnect();
85     }
86
87     return 0;
88 }
```

INSERT Error!
Same Primary Key

	EMPNO	EMPNAME	TITLE	MANAGER	SALARY	DNO
1	1003	M.CHO	MANAGER	4377	3000000	2
2	1365	S.KIM	STAFF	3426	1500000	1
3	1782	S.JEROME	STAFF	3426	3500000	3
4	2106	C.KIM	ASSISTANT MANAGER	1003	2500000	2
5	3011	S.LEE	GENERAL MANAGER	4377	4000000	3
6	3426	Y.PARK	MANAGER	4377	3000000	1
7	3427	J.CHOI	STAFF	3011	1500000	3
8	4377	L.LEE	PRESIDENT	NULL	5000000	2

ODBC Programming : INSERT Example 1



```
Microsoft Visual Studio Debug Console
Connected to DB01_Server!

SQLSTATE 23000
Native error code:2627
[Microsoft][ODBC SQL Server Driver][SQL Server]Violation of PRIMARY KEY constraint 'PK__EMPLOYEE_14CCF2EE5F56CB42'. Cannot insert duplicate key in object 'KIM.EMPLOYEE'. The duplicate key value is (1782)

C:\Users\김한주\source\repos\CPP\64\Release\CPP.exe (process 35192) exited with code 0.
Press any key to close this window . . .
```

ODBC Programming : Console Example 1

```
56 int main(int argc, char *argv[])
57 {
58     if (db_connect())
59     {
60         printf("Connected to %s!\n\n", dataSourceName);
61
62         SQLHSTMT hStmt; // Statement Handle
63         SQLCHAR query[101];
64
65         char deptNameOld[31], deptNameNew[31];
66         printf("Enter the old DEPARTMENT name: ");
67         scanf_s("%s", deptNameOld);
68         printf("Enter the new DEPARTMENT name: ");
69         scanf_s("%s", deptNameNew);
70
71         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
72         {
73             sprintf_s((char *)query, 101, "UPDATE DEPARTMENT SET DEPTNAME = '%s' WHERE DEPTNAME = '%s'", deptNameNew, deptNameOld);
74             SQLExecDirect(hStmt, query, SQL_NTS);
75
76             SQLCloseCursor(hStmt);
77             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
78         }
79
80         db_disconnect();
81     }
82
83     return 0;
84 }
```

ODBC Programming : Console Example 1

```
Microsoft Visual Studio Debug Console
Connected to DB01_Server!
Enter the old DEPARTMENT name: DEVELOPMENT
Enter the new DEPARTMENT name: DATABASE
C:\Users\김한주\source\repos\CPP\x64\Release\CPP.exe (process 31792) exited with code 0.
Press any key to close this window . . .
```

Results		Messages	
	DEPTNO	DEPTNAME	FLOOR
1	1	SALES	8
2	2	PLANNING	10
3	3	DEVELOPMENT	9
4	4	GENERAL AFFAIRS	7
5	5	RESEARCH	11



Results		Messages	
	DEPTNO	DEPTNAME	FLOOR
1	1	SALES	8
2	2	PLANNING	10
3	3	DATABASE	9
4	4	GENERAL AFFAIRS	7
5	5	RESEARCH	11

ODBC Programming : Console Example 2

```
56 int main(int argc, char *argv[])
57 {
58     if (db_connect())
59     {
60         printf("Connected to %s!\n\n", dataSourceName);
61
62         SQLHSTMT hStmt; // Statement Handle
63         SQLCHAR query[101];
64
65         int empNo;
66         printf("Enter an EMPLOYEE number: ");
67         scanf_s("%d", &empNo);
68
69         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
70         {
71             sprintf_s((char *)query, 101, "DELETE FROM EMPLOYEE WHERE EMPNO = %d", empNo);
72             SQLExecDirect(hStmt, query, SQL_NTS);
73
74             SQLCloseCursor(hStmt);
75             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
76         }
77
78         db_disconnect();
79     }
80
81     return 0;
82 }
```


ODBC Programming : Console Example 2

```
Microsoft Visual Studio Debug Console
Connected to DB01_Server!
Enter an EMPLOYEE number: 1782
C:\Users\김한주\source\repos\CPP\CPP\Release\CPP.exe (process 6088) exited with code 0.
Press any key to close this window . . .
```

	EMPNO	EMPNAME	TITLE	MANAGER	SALARY	DNO
1	1003	M,CHO	MANAGER	4377	3000000	2
2	1365	S,KIM	STAFF	3426	1500000	1
3	1782	S,JEROME	STAFF	3426	3500000	3
4	2106	C,KIM	ASSISTANT MANAGER	1003	2500000	2
5	3011	S,LEE	GENERAL MANAGER	4377	4000000	3
6	3426	Y,PARK	MANAGER	4377	3000000	1
7	3427	J,CHOI	STAFF	3011	1500000	3
8	4377	L,LEE	PRESIDENT	NULL	5000000	2



	EMPNO	EMPNAME	TITLE	MANAGER	SALARY	DNO
1	1003	M,CHO	MANAGER	4377	3000000	2
2	1365	S,KIM	STAFF	3426	1500000	1
3	2106	C,KIM	ASSISTANT MANAGER	1003	2500000	2
4	3011	S,LEE	GENERAL MANAGER	4377	4000000	3
5	3426	Y,PARK	MANAGER	4377	3000000	1
6	3427	J,CHOI	STAFF	3011	1500000	3
7	4377	L,LEE	PRESIDENT	NULL	5000000	2

ODBC Programming : Console Example 3

```
56 int main(int argc, char *argv[])
57 {
58     if (db_connect())
59     {
60         printf("Connected to %s!\n\n", dataSourceName);
61
62         SQLHSTMT hStmt; // Statement Handle
63         SQLCHAR query[101];
64
65         int deptNo, floor;
66         char deptName[31];
67         printf("Enter a DEPARTMENT number: ");
68         scanf_s("%d", &deptNo);
69         printf("Enter a DEPARTMENT name: ");
70         scanf_s("%s", deptName);
71         printf("Enter a DEPARTMENT floor: ");
72         scanf_s("%d", &floor);
73
74         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
75         {
76             sprintf_s((char *)query, 101, "INSERT INTO DEPARTMENT VALUES(%d,'%s',%d)", deptNo, deptName, floor);
77             SQLExecDirect(hStmt, query, SQL_NTS);
78
79             sprintf_s((char *)query, 101, "SELECT * FROM DEPARTMENT");
80             SQLExecDirect(hStmt, query, SQL_NTS);
81
82             SQLBindCol(hStmt, 1, SQL_C_SLONG, &deptNo, sizeof(int), NULL);
83             SQLBindCol(hStmt, 2, SQL_C_CHAR, deptName, 31, NULL);
84             SQLBindCol(hStmt, 3, SQL_C_SLONG, &floor, sizeof(int), NULL);
85
86             printf("\n");
87             while (SQLFetch(hStmt) != SQL_NO_DATA)
88             {
89                 printf("%-5d", deptNo);
90                 printf("%-3s", deptName);
91                 printf("%d\n", floor);
92             }
93
94             SQLCloseCursor(hStmt);
95             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
96         }
97
98         db_disconnect();
99     }
100
101     return 0;
102 }
```

BIND AS INTEGER

ODBC Programming : Console Example 3

```
Microsoft Visual Studio Debug Console
Connected to DB01_Server!

Enter a DEPARTMENT number: 6
Enter a DEPARTMENT name: IT
Enter a DEPARTMENT floor: 15

1 SALES 8
2 PLANNING 10
3 DATABASE 9
4 GENERAL AFFAIRS 7
5 RESEARCH 11
6 IT 15

C:\Users\김한주\source\repos\CPP\CPP\Release\CPP.exe (process 17508) exited with code 0.
Press any key to close this window . . .
```

Results			
	DEPTNO	DEPTNAME	FLOOR
1	1	SALES	8
2	2	PLANNING	10
3	3	DATABASE	9
4	4	GENERAL AFFAIRS	7
5	5	RESEARCH	11



Results			
	DEPTNO	DEPTNAME	FLOOR
1	1	SALES	8
2	2	PLANNING	10
3	3	DATABASE	9
4	4	GENERAL AFFAIRS	7
5	5	RESEARCH	11
6	6	IT	15

ODBC Programming : Handle Error

```
56 int main(int argc, char *argv[])
57 {
58     if (db_connect())
59     {
60         printf("Connected to %s!\n\n", dataSourceName);
61
62         SQLHSTMT hStmt; // Statement Handle
63         SQLCHAR query[101];
64         SQLRETURN retCode;
65
66         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
67         {
68             sprintf_s((char *)query, 101, "SELECT * FROM DEPARTMENT");
69             retCode = SQLExecDirect(hStmt, query, SQL_NTS);
70
71             if (retCode == SQL_ERROR || retCode == SQL_NO_DATA_FOUND)
72             {
73                 printf("Query execution error!\n");
74                 return -1;
75             }
76
77             SQLCloseCursor(hStmt);
78             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
79         }
80
81         db_disconnect();
82     }
83
84     return 0;
85 }
86
```

Microsoft Visual Studio Debug Console

Connected to DB01_Server!

Query execution error!

C:\Users\김한주\source\repos\CPP\CPP\Release\CPP.exe (process 10280) exited with code -1.
Press any key to close this window . . .

ODBC Programming : Schema Check

```
SQLRETURN SQLDescribeCol (SQLHSTMT hstmt,  
                           SQLSMALLINT icol,  
                           SQLCHAR *szColName,  
                           SQLSMALLINT cbColNameMax,  
                           SQLSMALLINT *pcbColName,  
                           SQLSMALLINT *pfSqlType,  
                           SQLINTEGER *pcbColDef,  
                           SQLSMALLINT *pibScale,  
                           SQLSMALLINT *pfNullable);
```

// Column의 속성을 가져오는 함수

ODBC Programming : Schema Check

```
170 int main(int argc, char *argv[])
171 {
172     if (db_connect())
173     {
174         printf("Connected to %s!\n\n", dataSourceName);
175
176         SQLHSTMT hStmt; // Statement Handle
177         SQLCHAR query[101];
178
179         SQLSMALLINT numCols = -1; // number of columns
180         SQLCHAR columnName[50][31];
181         SQLSMALLINT columnNameLen[50];
182         SQLSMALLINT columnDataType[50];
183         SQLULEN columnDataSize[50];
184         SQLSMALLINT columnDataDecimalDigits[50];
185         SQLSMALLINT columnDataNullable[50];
186
187         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
188         {
189             sprintf_s((char *)query, 101, "SELECT * FROM DEPARTMENT");
190             SQLExecDirect(hStmt, query, SQL_NTS);
191
192             SQLNumResultCols(hStmt, &numCols);
193             for (int i = 0; i < numCols; ++i)
194             {
195                 SQLDescribeCol(hStmt, i + 1, columnName[i], 30, &columnNameLen[i], &columnDataType[i],
196                               &columnDataSize[i], &columnDataDecimalDigits[i], &columnDataNullable[i]);
197
198                 printf("\nColumn #%d\n", i + 1);
199                 printf("\tName: %s\n\tName length: %d\n\tData type: %s\n\tData size: %d\n"
200                       "\tData decimal digits: %d\n\tData nullable: %d\n",
201                       columnName[i], columnNameLen[i], get_data_type_in_string(columnDataType[i]),
202                       columnDataSize[i], columnDataDecimalDigits[i], columnDataNullable[i]);
203             }
204
205             SQLCloseCursor(hStmt);
206             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
207         }
208
209         db_disconnect();
210     }
211
212     return 0;
```

ODBC Programming : Schema Check

```
SQLQuery1.sql -...OMPANY (KIM (77))*  X
CREATE TABLE DEPARTMENT(
    DEPTNO INT NOT NULL,
    DEPTNAME CHAR(20),
    FLOOR INT,
    PRIMARY KEY(DEPTNO)
);
```

```
Microsoft Visual Studio Debug Cons...
Connected to DB01_Server!

Column #1
  Name: DEPTNO
  Name length: 6
  Data type: INTEGER
  Data size: 10
  Data decimal digits: 0
  Data nullable: 0

Column #2
  Name: DEPTNAME
  Name length: 8
  Data type: CHAR
  Data size: 20
  Data decimal digits: 0
  Data nullable: 1

Column #3
  Name: FLOOR
  Name length: 5
  Data type: INTEGER
  Data size: 10
  Data decimal digits: 0
  Data nullable: 1

C:\Users\김한주\source\repos\CPP\64\Release\CPP.exe (process 18856) exited with code 0.
Press any key to close this window . . .
```

ODBC Programming 3 (Join Examples)

Database (Spring 2023)

ODBC Programming : Create Example Tables

```
SQLQuery1.sql - ...OMPANY (KIM (77))* ×
CREATE TABLE DEPARTMENT(
    DEPTNO INT NOT NULL,
    DEPTNAME CHAR(20),
    FLOOR INT,
    PRIMARY KEY(DEPTNO)
);

INSERT INTO DEPARTMENT VALUES(1, 'SALES', 8);
INSERT INTO DEPARTMENT VALUES(2, 'PLANNING', 10);
INSERT INTO DEPARTMENT VALUES(3, 'DEVELOPMENT', 9);
INSERT INTO DEPARTMENT VALUES(4, 'GENERAL AFFAIRS', 7);
INSERT INTO DEPARTMENT VALUES(5, 'RESEARCH', 11);
```

Create the DEPARTMENT table

ODBC Programming : Create Example Tables

```
SQLQuery1.sql -...OMPANY (KIM (58))* -+ X
CREATE TABLE EMPLOYEE(
    EMPNO INTEGER NOT NULL,
    EMPNAME CHAR(10) UNIQUE,
    TITLE CHAR(20) DEFAULT 'STAFF',
    DNO INTEGER,
    SALARY INTEGER,
    FLOOR INTEGER,
    PRIMARY KEY(EMPNO),
    FOREIGN KEY(DNO) REFERENCES DEPARTMENT(DEPTNO)
);

INSERT INTO EMPLOYEE VALUES(3426, 'Y.PARK', 'MANAGER', 3, 2500000, 9);
INSERT INTO EMPLOYEE VALUES(3011, 'S.LEE', 'GENERAL MANAGER', 1, 3000000, NULL);
INSERT INTO EMPLOYEE VALUES(3427, 'J.CHOI', 'STAFF', 3, 1500000, 9);
INSERT INTO EMPLOYEE VALUES(1003, 'M.CHO', 'ASSISTANT MANAGER', 1, 2000000, NULL);
INSERT INTO EMPLOYEE VALUES(2106, 'C.KIM', 'ASSISTANT MANAGER', 2, 2000000, NULL);
```

Create the EMPLOYEE table

ODBC Programming : Create Example Tables

```
SQLQuery1.sql -...OMPANY (KIM (58)) + ×
CREATE TABLE PROJECT(
    PRONAME VARCHAR(20),
    EMPNO INT,
    TAKE_TIME INT,
    PRIMARY KEY(PRONAME, EMPNO),
    FOREIGN KEY(EMPNO) REFERENCES EMPLOYEE(EMPNO)
);

INSERT INTO PROJECT VALUES('A', 2106, 10);
INSERT INTO PROJECT VALUES('A', 3426, 11);
INSERT INTO PROJECT VALUES('A', 3011, 5);
INSERT INTO PROJECT VALUES('B', 1003, 6);
INSERT INTO PROJECT VALUES('B', 3427, 15);
```

Create the PROJECT table

ODBC Programming : UPDATE Join

```
170 int main(int argc, char *argv[])
171 {
172     if (db_connect())
173     {
174         printf("Connected to %s!\n\n", dataSourceName);
175
176         SQLHSTMT hStmt; // Statement Handle
177         SQLCHAR query[201];
178
179         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
180         {
181             sprintf_s((char *)query, 201, "UPDATE EMPLOYEE SET SALARY = SALARY * 1.05 FROM PROJECT AS P "
182             "WHERE P.EMPNO = EMPLOYEE.EMPNO AND P.PRNAME = 'A'");
183             SQLExecDirect(hStmt, query, SQL_NTS);
184
185             SQLCloseCursor(hStmt);
186             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
187         }
188
189         db_disconnect();
190     }
191
192     return 0;
193 }
```

ODBC Programming : UPDATE Join

```
UPDATE EMPLOYEE  
SET SALARY = SALARY * 1.05  
FROM PROJECT AS P  
WHERE P.EMPNO = EMPLOYEE.EMPNO AND P.PRONAME = 'A'
```

	PRONAME	EMPNO	TAKE_TIME
1	A	2106	10
2	A	3011	5
3	A	3426	11
4	B	1003	6
5	B	3427	15

	EMPNO	EMPNAME	TITLE	DNO	SALARY	FLOOR
1	1003	M,CHO	ASSISTANT MANAGER	1	2000000	NULL
2	2106	C,KIM	ASSISTANT MANAGER	2	2000000	NULL
3	3011	S,LEE	GENERAL MANAGER	1	3000000	NULL
4	3426	Y,PARK	MANAGER	3	2500000	9
5	3427	J,CHOI	STAFF	3	1500000	9



	EMPNO	EMPNAME	TITLE	DNO	SALARY	FLOOR
1	1003	M,CHO	ASSISTANT MANAGER	1	2000000	NULL
2	2106	C,KIM	ASSISTANT MANAGER	2	2100000	NULL
3	3011	S,LEE	GENERAL MANAGER	1	3150000	NULL
4	3426	Y,PARK	MANAGER	3	2625000	9
5	3427	J,CHOI	STAFF	3	1500000	9

ODBC Programming : DELETE Join

```
170 int main(int argc, char *argv[])
171 {
172     if (db_connect())
173     {
174         printf("Connected to %s!\n\n", dataSourceName);
175
176         SQLHSTMT hStmt; // Statement Handle
177         SQLCHAR query[201];
178
179         if (SQLAllocHandle(SQL_HANDLE_STMT, hDbc, &hStmt) == SQL_SUCCESS)
180         {
181             sprintf_s((char *)query, 201, "DELETE PROJECT FROM EMPLOYEE AS E WHERE "
182             "E.EMPNO = PROJECT.EMPNO AND E.TITLE <> 'ASSISTANT MANAGER' AND PROJECT.TAKE_TIME < 10");
183
184             SQLExecDirect(hStmt, query, SQL_NTS);
185
186             SQLCloseCursor(hStmt);
187             SQLFreeHandle(SQL_HANDLE_STMT, hStmt);
188         }
189
190         db_disconnect();
191     }
192
193     return 0;
194 }
```

ODBC Programming : DELETE Join

```
DELETE PROJECT FROM EMPLOYEE AS E WHERE  
E.EMPNO = PROJECT.EMPNO AND E.TITLE <> 'ASSISTANT MANAGER' AND PROJECT.TAKE_TIME < 10
```

	EMPNO	EMPNAME	TITLE	DNO	SALARY	FLOOR
1	1003	M.CHO	ASSISTANT MANAGER	1	2000000	NULL
2	2106	C.KIM	ASSISTANT MANAGER	2	2100000	NULL
3	3011	S.LEE	GENERAL MANAGER	1	3150000	NULL
4	3426	Y.PARK	MANAGER	3	2625000	9
5	3427	J.CHOI	STAFF	3	1500000	9

	PRONAME	EMPNO	TAKE_TIME
1	A	2106	10
2	A	3011	5
3	A	3426	11
4	B	1003	6
5	B	3427	15



	PRONAME	EMPNO	TAKE_TIME
1	A	2106	10
2	A	3426	11
3	B	1003	6
4	B	3427	15