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In[1]:= In[95]:=
In[1]:=
(* 定义学生类 *)
Student[name_, id_, courses_] := Module[{}],
  <|"Name" -> name, "ID" -> id, "Courses" -> courses|>
]

(* 定义课程类 *)
Course[name_, code_, instructor_] := Module[{}],
  <|"Name" -> name, "Code" -> code, "Instructor" -> instructor|>
]

(* 创建初始的学生和课程列表 *)
students = {};
courses = {};

(* 定义插入学生函数 *)
InsertStudent[name_, id_, courses_] := Module[{student},
  student = Student[name, id, courses];
  AppendTo[students, student];
  Print["Student ", name, " inserted successfully."];
]

(* 定义插入课程函数 *)
InsertCourse[name_, code_, instructor_] := Module[{course},
  course = Course[name, code, instructor];
  AppendTo[courses, course];
  Print["Course ", name, " inserted successfully."];
]

(* 定义删除学生函数 *)
DeleteStudent[id_] := Module[{index},
  index = Position[students, student_ /; student["ID"] == id];
  If[Length[index] == 0,
    Print["Student with ID ", id, " not found."],
    students = Delete[students, index[[1]]];
    Print["Student with ID ", id, " deleted successfully."];
  ]
]

(* 定义删除课程函数 *)
DeleteCourse[code_] := Module[{index},
  index = Position[courses, course_ /; course["Code"] == code];
  If[Length[index] == 0,
    Print["Course with code ", code, " not found."],
    courses = Delete[courses, index[[1]]];
    Print["Course with code ", code, " deleted successfully."];
  ]
]

(* 定义函数来查找学生的课程列表 *)
FindCoursesForStudent[studentID_] := Module[{student},
  student = SelectFirst[students, #["ID"] == studentID &];
  If[student === Missing["NotFound"],
    Print["Student not found."],

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    Print["Courses for student ", student["Name"], ": ", student["Courses"]];
  ]
]

(* 定义函数来查找课程的学生列表 *)
FindStudentsForCourse[courseCode_] := Module[{course},
  course = SelectFirst[courses, #["Code"] == courseCode &];
  If[course === Missing["NotFound"],
    Print["Course not found."],
    Print["Students for course ", course["Name"], ": ",
      Select[students, MemberQ[#, course["Code"]] &][All, "Name"]];
  ]
]

(* 导入绘图库 *)
Needs["GraphUtilities`"]

(* 定义函数来绘制学生和课程的关系图 *)
DrawGraph := Module[{edges, vertices},
  edges = Flatten[Table[DirectedEdge[student["Name"], course["Name"]], {student, studen
  vertices = Union[Flatten[{students, courses}]]];
  GraphPlot[edges, VertexLabeling -> True, MultiedgeStyle -> True, ImageSize -> Medium]
]

(* 示例用法 *)
InsertStudent["Alice", 1, {"CS101", "CS102"}] (* 插入学生 *)
InsertStudent["Bob", 2, {"CS101", "CS103"}] (* 插入学生 *)
InsertStudent["Charlie", 3, {"CS102", "CS103"}] (* 插入学生 *)
InsertStudent["David", 4, {"CS101"}] (* 插入学生 *)

InsertCourse["Introduction to Computer Science", "CS101", "Prof. Smith"] (* 插入课程 *)
InsertCourse["Advanced Computer Science", "CS102", "Prof. Johnson"] (* 插入课程 *)
InsertCourse["Data Science", "CS103", "Prof. Brown"] (* 插入课程 *)

FindCoursesForStudent[1] (* 查找学生ID为1的课程列表 *)
FindStudentsForCourse["CS101"] (* 查找课程代码为"CS101"的学生列表 *)

(* 增加更多示例关系 *)
InsertStudent["Eve", 5, {"CS102", "CS103"}] (* 插入学生 *)
InsertStudent["Frank", 6, {"CS101", "CS102", "CS103"}] (* 插入学生 *)
InsertCourse["Machine Learning", "CS104", "Prof. Davis"] (* 插入课程 *)
InsertCourse["Database Management", "CS105", "Prof. Wilson"] (* 插入课程 *)

FindCoursesForStudent[2] (* 查找学生ID为2的课程列表 *)
FindStudentsForCourse["CS103"] (* 查找课程代码为"CS103"的学生列表 *)

(* 绘制学生和课程的关系图 *)
DrawGraph

DeleteStudent[1] (* 删除学生ID为1的学生 *)
DeleteCourse["CS101"] (* 删除课程代码为"CS101"的课程 *)
FindCoursesForStudent[1] (* 再次查找学生ID为1的课程列表, 确认学生已被删除 *)
FindStudentsForCourse["CS101"] (* 再次查找课程代码为"CS101"的学生列表, 确认课程已被删除 *)

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Out[1]= \$Failed

Student Alice inserted successfully.

Student Bob inserted successfully.

Student Charlie inserted successfully.

Student David inserted successfully.

Course Introduction to Computer Science inserted successfully.

Course Advanced Computer Science inserted successfully.

Course Data Science inserted successfully.

Student not found.

Students for course Introduction to Computer Science: {} [All, Name]

Student Eve inserted successfully.

Student Frank inserted successfully.

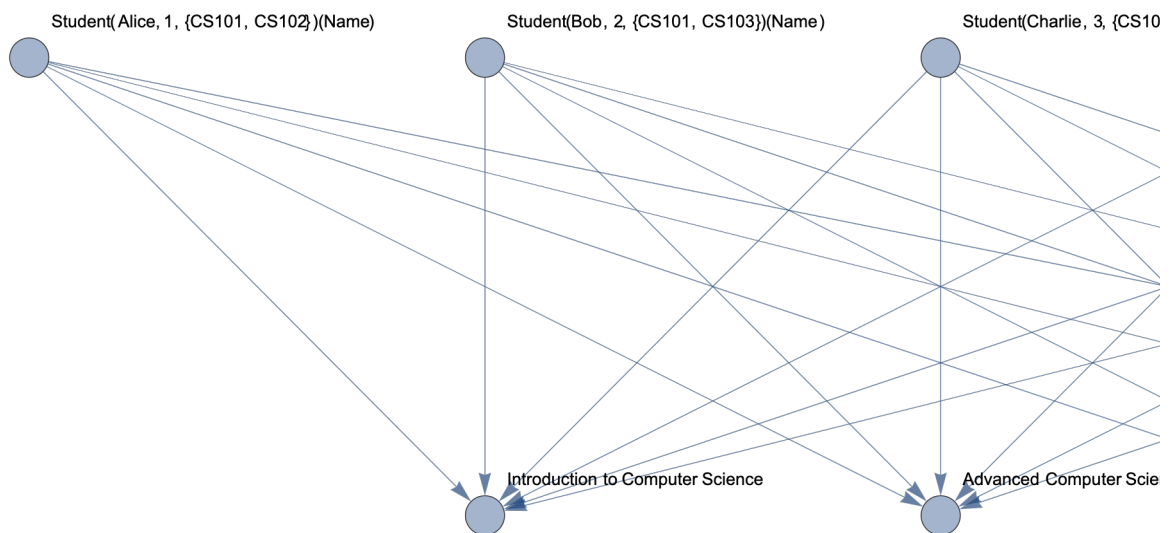
Course Machine Learning inserted successfully.

Course Database Management inserted successfully.

Student not found.

Students for course Data Science: {} [All, Name]

Out[57]=



Student with ID 1 not found.

Course with code CS101 deleted successfully.

Student not found.

Course not found.