Case Study:
UAMS
Domain Model Solution

Identify the Classes

Academic branch offers different programs within different departments each program has a degree title and duration of degree.
Student Apply for admission in University and provides his/her name, age, FSC, and Ecat Marks and selects any number of preferences among the available programs.
Admission department prepares a merit list according to the highest merit and available seats and registers selected students in the program.

Academic Branch also add subjects for each program. A subject have subject code, credit hours, subjectType, and subjectFee A Program cannot have more than 20 Credit hour subjects.A Student Registers multiple subjects but only from his enrolled program's subject but he/she can not take more than 9 credit hours.Fee department generate fees according to registered subjects of the students

Step 1: Identify the Classes which have attributes

Academic branch offers different programs within different departments each program has a degree title and duration of degree.

Student Apply for admission in University and provides his/her name, age, FSC, and Ecat Marks and selects any number of preferences among the available programs.

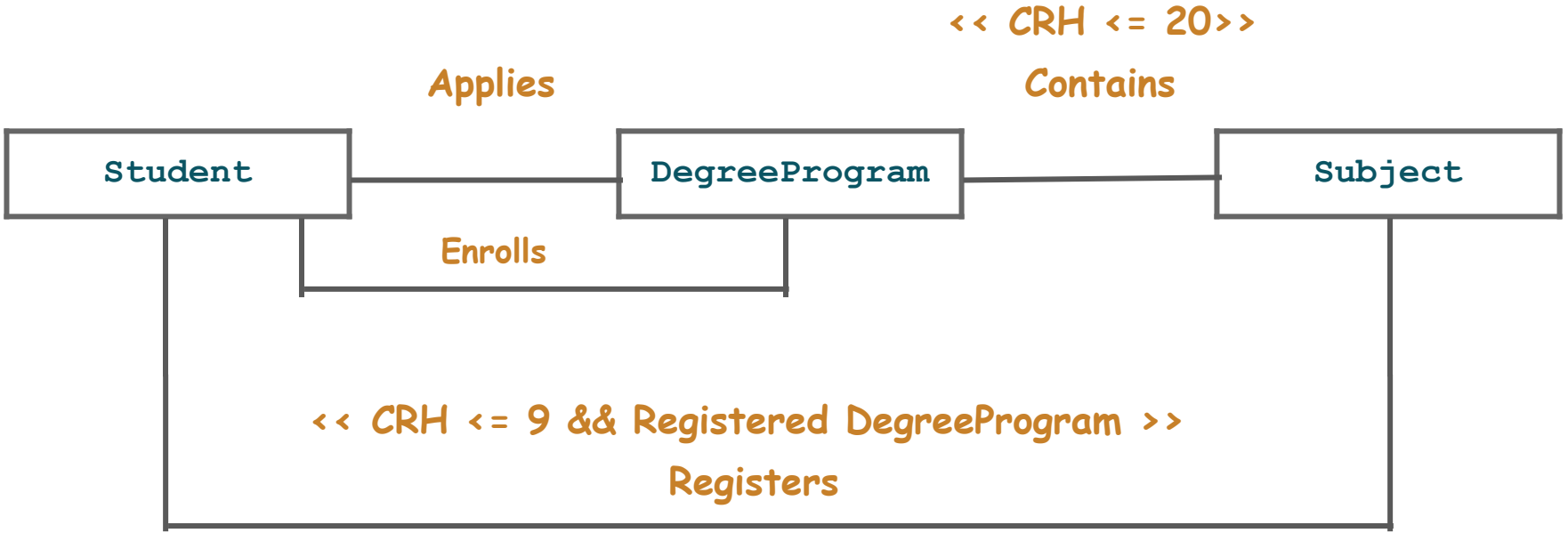
Admission department prepares a merit list according to the highest merit and available seats and registers selected students in the program.

Academic Branch also add subjects for each program. A subject have subject code, credit hours, subjectType, and subjectFee. A Program cannot have more than 20 Credit hour subjects.A Student Registers multiple subjects but only from his enrolled program's subject but he/she can not take more than 9 credit hours.

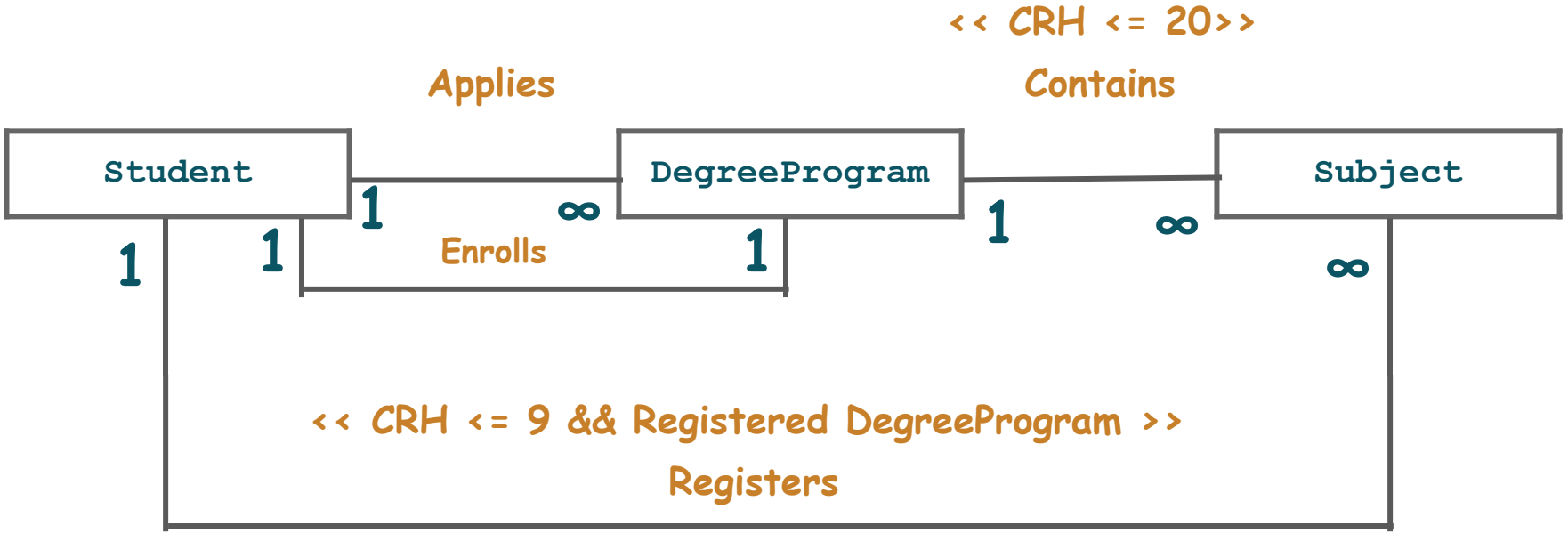
Fee department generate fees according to registered subjects of the students.

Step 2: Draw Domain Model: Write Classes name only

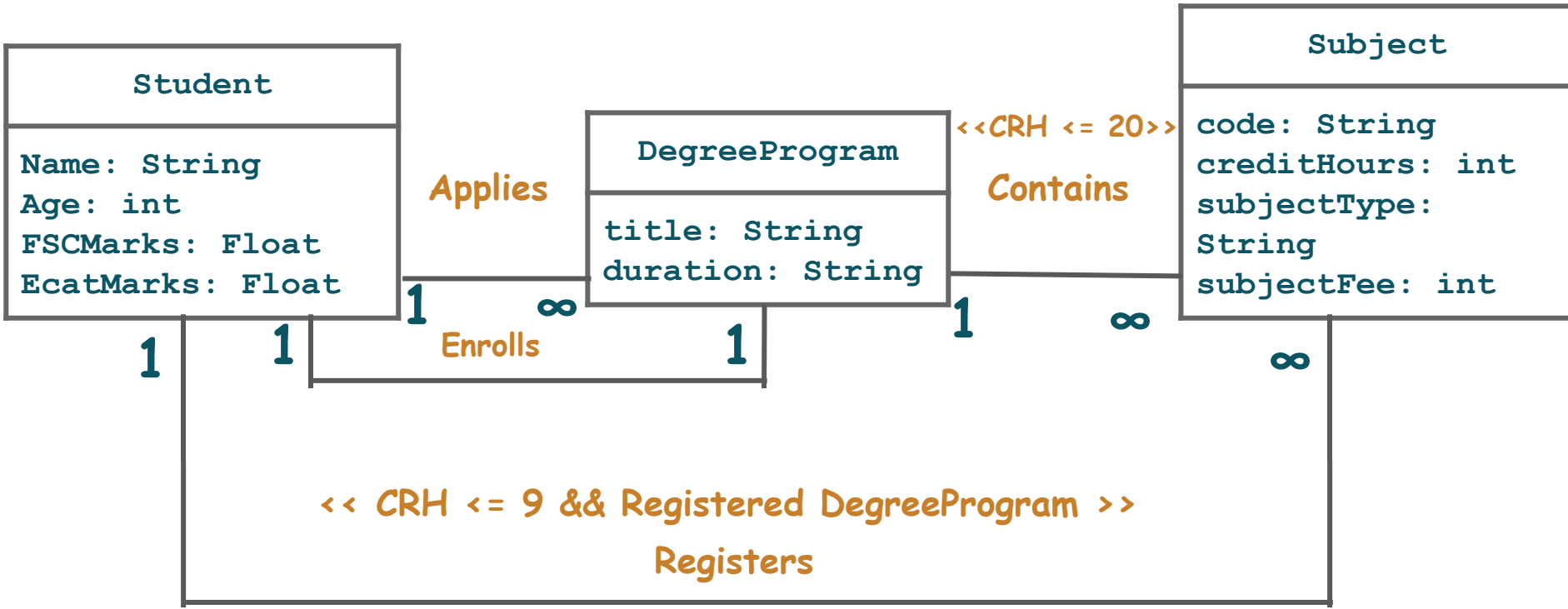
Step 3: Draw Domain Model: Add Relations and Constraints



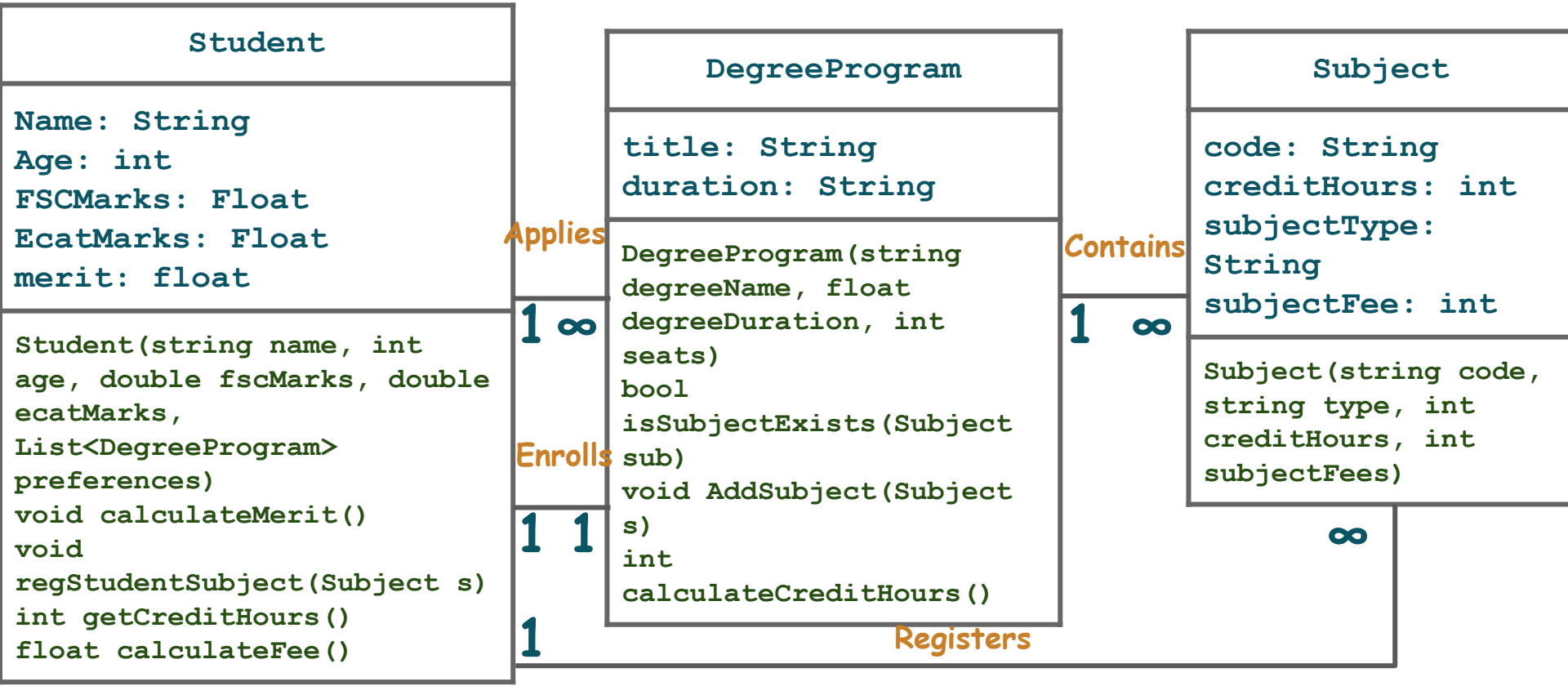
Step 4: Draw Domain Model: Add Multiplicity



Step 5: Draw Class Diagram: Add Attributes



Step 6: Draw Class Diagram: Add Functions



Step 7: Convert Class Diagram to Code

Student Class Attributes

```
class Student
{
    public string name;
    public int age;
    public double fscMarks;
    public double ecatMarks;
    public double merit;
    public List<DegreeProgram> preferences;
    public List<Subject> regSubject;
    public DegreeProgram regDegree;
}
```

Step 7: Convert Class Diagram to Code

Student Class Behaviours

```
    public Student(string name, int
age, double fscMarks, double ecatMarks,
List<DegreeProgram> preferences)
    {
    }

    public void calculateMerit()
    {
    }

    public int getCreditHours()
    {
    }

    public float calculateFee()
    {
    }
```

```
public void regStudentSubject(Subject s)
    {
        int stCH = getCreditHours();
        if (regDegree != null &&
regDegree.isSubjectExists(s) && stCH +
s.creditHours <= 9)
        {
            regSubject.Add(s);
        }
        else
        {
            Console.WriteLine("A student
cannot have more than 9 CH or Wrong
Subject");
        }
    }
```

Step 7: Convert Class Diagram to Code

Student Class Behaviours

```
    public Student(string name, int
age, double fscMarks, double ecatMarks,
List<DegreeProgram> preferences)
    {
    }

    public void calculateMerit()
    {
    }

    public int getCreditHours()
    {
    }

    public float calculateFee()
    {
    }
```

```
public void regStudentSubject(Subject s)
    {
        int stCH = getCreditHours();
        if (regDegree != null &&
regDegree.isSubjectExists(s) && stCH +
s.creditHours <= 9)
        {
            regSubject.Add(s);
        }
        else
        {
            Console.WriteLine("A student
cannot have more than 9 CH or Wrong
Subject");
        }
    }
```

What is Wrong with this Approach?

Step 7: Convert Class Diagram to Code

Student Class Behaviours

```
    public Student(string name, int
age, double fscMarks, double ecatMarks,
List<DegreeProgram> preferences)
    {
    }

    public void calculateMerit()
    {
    }

    public int getCreditHours()
    {
    }

    public float calculateFee()
    {
    }
```

```
public void regStudentSubject(Subject s)
    {
        int stCH = getCreditHours();
        if (regDegree != null &&
regDegree.isSubjectExists(s) && stCH +
s.creditHours <= 9)
        {
            regSubject.Add(s);
        }
        else
        {
            Console.WriteLine("A student
cannot have more than 9 CH or Wrong
Subject");
        }
    }
```

There should be no Input Output in the BL

Step 7: Convert Class Diagram to Code

Subject Class Attributes and Behaviours

```
class Subject
{
    public string code;
    public string type;
    public int creditHours;
    public int subjectFees;

    public Subject(string code, string type,
int creditHours, int subjectFees)
    {
        this.code = code;
        this.type = type;
        this.creditHours = creditHours;
        this.subjectFees = subjectFees;
    }
}
```

Step 7: Convert Class Diagram to Code

DegreeProgram Class Attributes and Behaviours

```
class DegreeProgram
{
    public string degreeName;
    public float degreeDuration;
    public List<Subject> subjects;
    public int seats;
}
```

Step 7: Convert Class Diagram to Code

DegreeProgram Class Behaviours

```
public DegreeProgram(string degreeName, float
degreeDuration, int seats)
    {
        this.degreeName = degreeName;
        this.degreeDuration = degreeDuration;
        this.seats = seats;
        subjects = new List<Subject>();
    }

    public int calculateCreditHours()
    {
    }

     public bool isSubjectExists(Subject sub)
    {
    }
}
```

```
    public void AddSubject(Subject s)
    {
        int creditHours =
calculateCreditHours();
        if(creditHours + s.creditHours
<= 20)
        {
            subjects.Add(s);
        }
        else
        {
            Console.WriteLine("20 credit
hour limit exceeded");
        }
    }
```

Step 8: Main

```
static List<Student> studentList = new List<Student>();
static List<Student> sortedStudentList = new List<Student>();
static List<DegreeProgram> programList = new
List<DegreeProgram>();
static void Main(string[] args)
{
    int option;
    do
    {
        option = Menu();
        clearScreen();
        if (option == 1)
        {
            if (programList.Count > 0)
            {
                Student s = takeInputForStudent();
                addIntoStudentList(s);
            }

        }
        else if (option == 2)
        {
            DegreeProgram d = takeInputForDegree();
            addIntoDegreeList(d);
        }
```

```
else if (option == 3){
    sortStudentsByMerit();
    giveAdmission();
    printStudents();
}
else if (option == 4){
    viewRegisteredStudents();
}
else if (option == 5){
    string degName;
    Console.Write("Enter Degree Name: ");
    degName = Console.ReadLine();
    viewStudentInDegree(degName);
}
else if (option == 6){
    Console.Write("Enter the Student Name: ");
    string name = Console.ReadLine();
    Student s = StudentPresent(name);
    if (s != null){
        s.viewSubjects();
        registerSubjects(s);
    }
}
else if (option == 7){
    calculateFee();
}
clearScreen();
}
while (option != 8);
    Console.ReadKey();
}
```

Step 8: Main

```
static List<Student> studentList = new List<Student>();
static List<Student> sortedStudentList = new List<Student>();
static List<DegreeProgram> programList = new
List<DegreeProgram>();
static void Main(string[] args)
{
    int option;
    do
    {
        option = Menu();
        clearScreen();
        if (option == 1)
        {
            if (programList.Count > 0)
            {
                Student s = takeInputForStudent();
                addIntoStudentList(s);
            }

        }
        else if (option == 2)
        {
            DegreeProgram d = takeInputForDegree();
            addIntoDegreeList(d);
        }
```

What is Wrong with this Code?

```
else if (option == 3){
    sortStudentsByMerit();
    giveAdmission();
    printStudents();
}
else if (option == 4){
    viewRegisteredStudents();
}
else if (option == 5){
    string degName;
    Console.Write("Enter Degree Name: ");
    degName = Console.ReadLine();
    viewStudentInDegree(degName);
}
else if (option == 6){
    Console.Write("Enter the Student Name: ");
    string name = Console.ReadLine();
    Student s = StudentPresent(name);
    if (s != null){
        s.viewSubjects();
        registerSubjects(s);
    }
}
else if (option == 7){
    calculateFee();
}
clearScreen();
}
while (option != 8);
    Console.ReadKey();
}
```

Step 8: Main

```
static List<Student> studentList = new List<Student>();
static List<Student> sortedStudentList = new List<Student>();
static List<DegreeProgram> programList = new
List<DegreeProgram>();
static void Main(string[] args)
{
    int option;
    do
    {
        option = Menu();
        clearScreen();
        if (option == 1)
        {
            if (programList.Count > 0)
            {
                Student s = takeInputForStudent();
                addIntoStudentList(s);
            }

        }
        else if (option == 2)
        {
            DegreeProgram d = takeInputForDegree();
            addIntoDegreeList(d);
        }
```

It's better to pass make the Lists in the main function and pass them only to the specific functions that require them

```
else if (option == 3){
    sortStudentsByMerit();
    giveAdmission();
    printStudents();
}
else if (option == 4){
    viewRegisteredStudents();
}
else if (option == 5){
    string degName;
    Console.Write("Enter Degree Name: ");
    degName = Console.ReadLine();
    viewStudentInDegree(degName);
}
else if (option == 6){
    Console.Write("Enter the Student Name: ");
    string name = Console.ReadLine();
    Student s = StudentPresent(name);
    if (s != null){
        s.viewSubjects();
        registerSubjects(s);
    }
}
else if (option == 7){
    calculateFee();
}
clearScreen();
}
while (option != 8);
    Console.ReadKey();
}
```

WireFrames: Main Menu

```
****************************************
                UAMS
****************************************
1. Add Student
2. Add Degree Program
3. Generate Merit
4. View Registered Students
5. View Students of a Specific Program
6. Register Subjects for a Specific Student
7. Calculate Fees for all Registered Students
8. Exit
Enter Option:
```

WireFrames: Option 2: Degree Program

```
Enter Degree Name: CE
Enter Degree Duration: 4
Enter Seats for Degree: 1
Enter How many Subjects to Enter: 1
Enter Subject Code: 162
Enter Subject Type: OOP
Enter Subject Credit Hours: 3
Enter Subject Fees: 8000
Press any key to Continue..
```

WireFrames: Option 1: Add Student

```
Enter Student Name: AAA
Enter Student Age: 12
Enter Student FSc Marks: 1000
Enter Student Ecat Marks: 390
Available Degree Programs
CS
Enter how many preferences to Enter: 1
CS
Press any key to Continue..
```

WireFrames: Option 3: Generate Merit

```
AAA got Admission in CS
BBB did not get Admission
CCC got Admission in CE
DDD did not get Admission
Press any key to Continue..
```

WireFrames: Option 4: Registered Student

```
Name     FSC      Ecat     Age
AAA      1000     390      12
CCC      999      380      15
Press any key to Continue..
```

WireFrames: Option 5: Specific Degree

```
Enter Degree Name: CS
Name     FSC      Ecat     Age
AAA      1000     390      12
Press any key to Continue..
```

WireFrames: Option 6: Register Subject

Ask the Student name and then ask for the subject code.
If the conditions are satisfied then student's subject should be registered.

WireFrames: Option 7: Generate Fee

Fees should be generated for all the registered students

Conclusion

- OOP Paradigm recommends to create multiple classes for each real world concept with its own attributes and behaviours those operate on these attributes.
- The information of number of instances appear in a relation is called the Multiplicity of the Relation
- The graphical way to represent classes, attributes, operations, relation (collaboration) and Multiplicity between classes is called Class Diagram or Domain Model.

Learning Objective

Identify multiple classes and Association among these classes and draw the Domain Model.

Self Assessment

1. Implement this using C# code with multiple Classes.

Academic branch offers different programs within different departments each program has a degree title and duration of degree.
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Admission department prepares a merit list according to the highest merit and available seats and registers selected students in the program.
Academic Branch also add subjects for each program. A subject have subject code, credit hours, subjectType. A Program cannot have more than 20 Credit hour subjects.A Student Registers multiple subjects but he/she can not take more than 9 credit hours.
Fee department generate fees according to registered subjects of the students.