Testcase1: testcase_1.csv

Output:

1st run:

```
Unique Courses:  {FELEC2=11, FCDC3=6, FCDC2=5}
Total courses alloted : 2.00
All CDCs alloted successfully!
Edge 0 -> 11 | flow = 0.50
Edge 1 -> 6 | flow = 1.00
Edge 2 -> 5 | flow = 1.00
```

2nd run:

```
Unique Courses:  {FELEC2=11, FCDC3=6, FCDC2=5}
Total courses alloted : 3.00
All CDCs alloted successfully!
Edge 0 -> 11 | flow = 0.50
Edge 1 -> 6 | flow = 0.50
Edge 1 -> 11 | flow = 0.50
Edge 2 -> 5 | flow = 1.00
Edge 2 -> 6 | flow = 0.50
```

10th run:

```
Unique Courses:  {FELEC2=11, FCDC3=6, FCDC2=5}Allocation not shown as all CDCs not alloted. CRASH!
```

The randomization of course capacity of the "x3" professors leads to all CDCs not being allocated in certain runs. We have incorporated this check in the code to ensure that no output is given when this situation occurs.

Testcase 2: testcase_2.csv

Output:

1st run:

```
Unique Courses:  {FELE2=27, FCDC4=23, FELE3=28, HCDC1=24, FELE1=26, FELE4=29, HELE2=31, FCDC1=20, HELE1=30, FCDC3=22, HCDC2=25, FCDC2=21}
Total courses alloted : 12.00
All CDCs alloted successfully!
Edge 0 -> 30 | flow = 0.50
Edge 1 -> 26 | flow = 1.00
Edge 2 -> 27 | flow = 0.50
Edge 3 -> 31 | flow = 0.50
Edge 4 -> 24 | flow = 0.50
Edge 4 -> 28 | flow = 0.50
Edge 5 -> 27 | flow = 0.50
Edge 5 -> 31 | flow = 0.50
Edge 6 -> 28 | flow = 0.50
Edge 6 -> 30 | flow = 0.50
Edge 7 -> 25 | flow = 0.50
Edge 7 -> 29 | flow = 1.00
Edge 8 -> 24 | flow = 0.50
Edge 9 -> 25 | flow = 0.50
Edge 10 -> 21 | flow = 0.50
Edge 10 -> 22 | flow = 1.00
Edge 11 -> 20 | flow = 0.50
Edge 11 -> 21 | flow = 0.50
Edge 12 -> 20 | flow = 0.50
Edge 13 -> 23 | flow = 0.50
Edge 14 -> 23 | flow = 0.50
```

2nd run:

```
Unique Courses:  {FELE2=27, FCDC4=23, FELE3=28, HCDC1=24, FELE1=26, FELE4=29, HELE2=31, FCDC1=20, HELE1=30, FCDC3=22, HCDC2=25, FCDC2=21}
Total courses alloted : 12.00
All CDCs alloted successfully!
Edge 0 -> 31 | flow = 0.50
Edge 1 -> 26 | flow = 1.00
Edge 2 -> 27 | flow = 0.50
Edge 2 -> 30 | flow = 0.50
Edge 3 -> 28 | flow = 0.50
Edge 4 -> 25 | flow = 0.50
Edge 4 -> 28 | flow = 0.50
Edge 5 -> 27 | flow = 0.50
Edge 5 -> 31 | flow = 0.50
Edge 6 -> 29 | flow = 0.50
Edge 6 -> 30 | flow = 0.50
Edge 7 -> 25 | flow = 0.50
Edge 7 -> 24 | flow = 0.50
Edge 7 -> 29 | flow = 0.50
Edge 8 -> 22 | flow = 0.50
Edge 8 -> 24 | flow = 0.50
Edge 9 -> 21 | flow = 1.00
Edge 9 -> 22 | flow = 0.50
Edge 10 -> 20 | flow = 1.00
Edge 11 -> 23 | flow = 1.00
```

10th run:

```
Unique Courses:  {FELE2=27, FCDC4=23, FELE3=28, HCDC1=24, FELE1=26, FELE4=29, HELE2=31, FCDC1=20, HELE1=30, FCDC3=22, HCDC2=25, FCDC2=21}
Total courses alloted : 12.00
All CDCs alloted successfully!
Edge 0 -> 30 | flow = 0.50
Edge 1 -> 26 | flow = 1.00
Edge 2 -> 27 | flow = 0.50
Edge 3 -> 31 | flow = 0.50
Edge 4 -> 28 | flow = 1.00
Edge 5 -> 27 | flow = 0.50
Edge 5 -> 31 | flow = 0.50
Edge 6 -> 29 | flow = 0.50
Edge 6 -> 30 | flow = 0.50
Edge 7 -> 25 | flow = 1.00
Edge 7 -> 29 | flow = 0.50
Edge 8 -> 24 | flow = 1.00
Edge 9 -> 22 | flow = 1.00
Edge 10 -> 21 | flow = 1.00
Edge 11 -> 20 | flow = 0.50
Edge 12 -> 20 | flow = 0.50
Edge 13 -> 23 | flow = 1.00
```

As the number of professors is much greater than the maximum number required for course allocation, this case leads to all courses being allocated. However, the number of professors taking the course and their identities differ due to randomization.

Testcase 3: testcase_3.csv

Output:

1st run:

```
Unique Courses:  {FELE2=18, FCDC4=14, FELE3=19, HCDC1=15, FELE1=17, FELE4=20, HELE2=22, FCDC1=11, HELE1=21, FCDC3=13, HCDC2=16, FCDC2=12}
Total courses alloted : 9.00
All CDCs alloted successfully!
Edge 0 -> 19 | flow = 0.50
Edge 1 -> 20 | flow = 1.00
Edge 2 -> 18 | flow = 1.00
Edge 2 -> 17 | flow = 0.50
Edge 3 -> 16 | flow = 0.50
Edge 4 -> 15 | flow = 1.00
Edge 5 -> 16 | flow = 0.50
Edge 5 -> 22 | flow = 0.50
Edge 6 -> 13 | flow = 1.00
Edge 7 -> 11 | flow = 0.50
Edge 7 -> 12 | flow = 1.00
Edge 8 -> 14 | flow = 0.50
Edge 8 -> 11 | flow = 0.50
Edge 9 -> 14 | flow = 0.50
```

2nd run:

```
Unique Courses:  {FELE2=18, FCDC4=14, FELE3=19, HCDC1=15, FELE1=17, FELE4=20, HELE2=22, FCDC1=11, HELE1=21, FCDC3=13, HCDC2=16, FCDC2=12}
Total courses alloted : 8.00
All CDCs alloted successfully!
Edge 0 -> 20 | flow = 0.50
Edge 1 -> 17 | flow = 1.00
Edge 2 -> 16 | flow = 0.50
Edge 2 -> 18 | flow = 0.50
Edge 3 -> 15 | flow = 0.50
Edge 4 -> 13 | flow = 0.50
Edge 4 -> 15 | flow = 0.50
Edge 5 -> 16 | flow = 0.50
Edge 5 -> 19 | flow = 0.50
Edge 6 -> 12 | flow = 0.50
Edge 6 -> 13 | flow = 0.50
Edge 7 -> 12 | flow = 0.50
Edge 8 -> 11 | flow = 0.50
Edge 9 -> 14 | flow = 1.00
Edge 9 -> 11 | flow = 0.50
```

3rd run:

```
Unique Courses:  {FELE2=18, FCDC4=14, FELE3=19, HCDC1=15, FELE1=17, FELE4=20, HELE2=22, FCDC1=11, HELE1=21, FCDC3=13, HCDC2=16, FCDC2=12}
Total courses alloted : 7.00
All CDCs alloted successfully!
Edge 0 -> 20 | flow = 0.50
Edge 1 -> 17 | flow = 1.00
Edge 2 -> 18 | flow = 0.50
Edge 3 -> 15 | flow = 0.50
Edge 4 -> 13 | flow = 1.00
Edge 5 -> 16 | flow = 1.00
Edge 6 -> 12 | flow = 1.00
Edge 7 -> 11 | flow = 1.00
Edge 8 -> 14 | flow = 0.50
Edge 9 -> 14 | flow = 0.50
```

10th run:

```
Unique Courses:  {FELE2=18, FCDC4=14, FELE3=19, HCDC1=15, FELE1=17, FELE4=20, HELE2=22, FCDC1=11, HELE1=21, FCDC3=13, HCDC2=16, FCDC2=12}
Allocation not shown as all CDCs not alloted. CRASH!
```

Having reduced the number of professors compared to the 2nd test case, there may arise a situation where all CDCs are not allocated, as seen above.

Testcase 4: testcase_4.csv

Output:

```
Unique Courses:  {FCDC1=3}Crashed because an x2 professor was allocated less than 1 course
```

This test case checks whether the code crashes if an "x2" professor is allocated less than one course.

Testcase 5: testcase_5.csv

Output:

```
Unique Courses:  {FCDC1=4, FCDC2=5}Allocation not shown as all CDCs not alloted. CRASH!
```

This test case checks whether the code always crashes as the number of professors are not enough to fulfill the allocation requirement.