Evaluation

The vector’s prime benefit is its linear form, when each course is keyed to it’s course number rather than a calculated value placing it at a different index. This makes it easy and fast to parse over and print all the information in the vector at once.

| **Vector** | **Line Cost** | **# Times Executes** | **Total Cost** |
| --- | --- | --- | --- |
| **for all courses** | 1 | N | N |
| **if the course is the same as courseNumber** | 1 | N | N |
| **print out the course information** | 2 | 2 | 4 |
| **for each prerequisite of the course** | 1 | N | N |
| **print the prerequisite course information** | 2 | N | 2N |
| **Total Cost** | | | 5N + 4 |
| **Runtime** | | | O(N) |

The hash table takes the same amount of time to complete as the Vector method (in part because it is based on a vector) although the runtime appears to be the same there is a difference in complexity as it starts at the index where the course would be if the spot was not already occupied Making it jump in part of the way through the vector and traversing potentially all the way back around.

| **Hash Table** | **Line Cost** | **# Times Executes** | **Total Cost** |
| --- | --- | --- | --- |
| **for all courses** | 2 | N | 2N |
| **if the course is the same as courseNumber** | 1 | N | N |
| **print out the course information** | 2 | 2 | 4 |
| **for each prerequisite of the course** | 1 | N | N |
| **print the prerequisite course information** | 1 | N | N |
| **Total Cost** | | | 5N+4 |
| **Runtime** | | | O(N) |

The binary search tree has the lowest predicted total line cost due to its quick search and pre-ordered nature making it faster to find a given value each iteration cutting a significant percentage of the remaining tree.

| **Binary Search Tree** | **Line Cost** | **# Times Executes** | **Total Cost** |
| --- | --- | --- | --- |
| **for all courses** | 1 | N | N |
| **if the course is the same as courseNumber** | 1 | N | N |
| **print out the course information** | 1 | N | N |
| **for each prerequisite of the course** | 1 | N | N |
| **print the prerequisite course information** | 1 | N | N |
| **Total Cost** | | | 5N |
| **Runtime** | | | O(N) |

Based on the analysis I recommend using the Binary search tree. It will provide quick searches for the keyed item and allow for a smooth ordered runtime with printing all data.