Some programming concepts presented in the program

1. **Method overloading:** In the CourseSystem class, there are two overloading methods: findCourse() and findStudent(). For findCourse(), there are two overloads:

Course findCourse(String courseName, int section)

ArrayList<Course> findCourse(String courseName)

The first method find a specific Course object by course name and section number.

The second method find a list of Courses that have the same course name but different section number.

For findStudent(), there are three overloads:

Student findStudent(String firstName, String lastName)d

Student findStudent(long id)

Student findStudent(String userName)

The first method find a Student object with first name and last name

The second method find a Student object with an id. Each student has a unique ID, and is generated by generateId()method in Student class

The third method find a Student object with a username.

1. **Method overriding:** There are several examples of method overriding in the program. Two examples are below:
   1. The **User** class is the parent class for Admin and Student. It has a getInfo() method that returns a String with a format “Username: xxx Full Name: xxx”. The **Student** class overrides this method, and returns a String with format “Name: xxx ID: xxx”
   2. The **User** class also has a method called **showAllCourses()**, which prints a list of all courses’ information. When the user chooses a specific course, it will show the detailed information of the course, including all students’ names of the course. The **Student** class overrides this method. When called by a **Student** object, the method will only show **brief** information of all courses. This means students will not be able to see all students’ names of the course. (However, since **Admin** class does not override it, admins can see detailed information)
2. **Abstract Class:** The **User** class is an abstract class, which means users can’t create a instance of **User** class using new(). It has an abstract method called **showMenu().** Since **Admin** and **Student** classes extend **User** class, they override this method, so that the program can show different menu for students and admins.
3. **Inheritance:** As mentioned above, **Admin** and **Student** classes inherit **User** class, so that both class automatically inherit all data fields and methods from **User** class, including userName, password, firstName, lastName, all getters and setters, getInfo(), etc.
4. **Encapsulation:** To protect the program, all data fields in every class are declared private, and getters are provided for each field, while setters are only provided for fields that need to be changed in the program. Moreover, when a **Course** object is needed, the **Course** object does not return itself, instead it execute its **copy()** method, which returns a safe copy of the object. Furthermore, the **CourseSystem** class also has a **getCoursesCopy()** method, which returns a safe copy of the list of all courses.