```python
class Course(object):
    """An instance represents an offering of a course at Cornell.  There is a
    separate Course instance for each semester in which a course is offered.
    Each course also keeps track of the students who are enrolled.

    Instance variables:
       title [str] -- title of course
       credits [int] -- number of credits
       students [list of Student] -- list of students enrolled in this course
    """

    def __init__(self, title, credits):
        """A new course with the given title and number of credits.
        The course starts out with no students enrolled.
        Pre: title is a string (e.g., 'CS1110: Awesome Introduction to Python')
             credits is a positive integer
        """
        self.title = title
        self.credits = credits
        self.students = []


class Schedule(object):
    """Instances represent a student's schedule for one semester.

    Instance variables:
       student [Student] -- the student whose schedule this is
       semester [str] -- the semester this schedule is for
       courses [list of Course] -- the Courses in this schedule
    """

    def __init__(self, student, semester):
        """A schedule for <student> in <semester>, which starts with no courses.
        """
        self.student = student
        self.semester = semester
        self.courses = []

    def total_credits(self):
        """Return: the total number of credits in this schedule.
        """
        total = 0
        for course in self.courses:
            total += course.credits
        return total

    def overlaps(self, other_schedule):
        """Return: True if this schedule contains any course with the same title
        as a course contained in <other_schedule>.
        Pre: other_schedule is a Schedule.
        """
        for course in self.courses:
            if other_schedule.contains_course(course):
                return True
        return False

    def contains_course(self, query_course):
        """Return: True if this schedule contains a course with the same title
        as <query_course>.
        """
        for course in self.courses:
            if course.title == query_course.title:
                return True
        return False
```

```python


class Student(object):
    """Instances represent students at Cornell.  For each student, we keep track
    of their schedules for each semester they've been at Cornell.

    Instance variables:
       name [str] ---  Name of student
       schedules [list of Schedule] -- the student's schedules from all semesters,
          in reverse chronological order.  The Schedule for the current semester
          is at position 0 in this list.
    """

    def __init__(self, name):
        """A new student named <name>, who starts with no schedules.
        Pre: <name> is a string.
        """
        self.name = name
        self.schedules = []

    def start_semester(self, semester):
        """Set up for a new semester by adding an empty Schedule at the head
        of the schedules list.
        Pre: <semester> is a string, such as '2014sp'
        """
        self.schedules.insert(0, Schedule(self, semester))

    def add_course(self, course):
        """Add a course for the current semester.  This means the course is added
        to the student's current schedule, and the student is added to the
        enrollment of the course.
        Pre: <course> is a Course, the student has a current schedule, and <course>
             is not already on the current semester's schedule.
        """
        # TODO: implement this method

    def validate(self, credit_limit):
        """Return: True if the student's schedule for the current semester is
        valid, which means that
           (a) the total number of credits in the current semester is not over
               <credit_limit> (credits from prior semesters don't matter)
           (b) the student is not taking any courses in the current semester that
               they already took in a previous semester.  Course titles are used
               to determine when a course is repeated; see Schedule.overlaps.
        Pre: credit_limit is an integer, and the student has a current schedule.
        """
        # TODO: implement this method
        # Be sure to take the time to read through all the methods in Schedule --
        # using them makes this method much shorter to implement.


def test_enrollment():
    """Test the enrollment system, making sure particularly that validation of
    schedules works properly and that students get enrolled in the courses
    that go on their schedules."""

    # Four courses, offered in each of two semesters
    c1_s14 = Course('CS1110: Awesome Python', 4)
    c2_s14 = Course('CS2110: Jolly Java', 4)
    c3_s14 = Course('CS4740: Natural Language Processing', 4)
    c4_s14 = Course('CS4620: Computer Graphics', 3)
    c1_f14 = Course('CS1110: Awesome Python', 4)
    c2_f14 = Course('CS2110: Jolly Java', 4)
    c3_f14 = Course('CS4740: Natural Language Processing', 4)
    c4_f14 = Course('CS4620: Computer Graphics', 3)
```

```
130
131     # A student whose course enrollment validates OK
132     ljl = Student('Lillian Lee')
133     ljl.start_semester('Spring 2014')
134     ljl.add_course(c1_s14)
135     ljl.start_semester('Fall 2014')
136     ljl.add_course(c2_f14)
137     assert ljl.schedules[1].contains_course(c1_s14)
138     assert not ljl.schedules[1].contains_course(c2_f14)
139     assert not ljl.schedules[0].overlaps(ljl.schedules[1])
140     assert ljl.schedules[0].total_credits() == 4
141     assert ljl.validate(5)
142
143     # A student who is trying to re-take a course
144     srm = Student('Steve Marschner')
145     srm.start_semester('Spring 2014')
146     srm.add_course(c1_s14)
147     srm.start_semester('Fall 2014')
148     srm.add_course(c1_f14)
149     assert srm.schedules[1].contains_course(srm.schedules[0].courses[0])
150     assert srm.schedules[1].overlaps(srm.schedules[0])
151     assert not srm.validate(5)
152
153     # A student who is trying to take too many credits
154     mcp = Student('Mary Pisaniello')
155     mcp.start_semester('Fall 2014')
156     mcp.add_course(c1_f14)
157     mcp.add_course(c2_f14)
158     mcp.add_course(c3_f14)
159     mcp.add_course(c4_f14)
160     assert mcp.schedules[0].total_credits() == 15
161     assert not mcp.validate(14)
162
163     # Check that enrollments came out OK
164     assert set(c1_s14.students) == set([ljl, srm])
165     assert set(c2_f14.students) == set([ljl, mcp])
166
167
168 if __name__ == '__main__':
169     test_enrollment()
```