

# OOP Lab Quiz (20 minutes)

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## Question1 : (20 marks)

You are tasked with simulating an Online School Management System. In this system, we need to manage multiple students, their enrolled courses, and the associated teachers. Additionally, the system should allow polymorphism for different types of courses (e.g., Theory and Practical).

### 1. Classes Required:

#### 1.1 Student Class:

- The Student class should have the following properties:
  - name (string)
  - studentID (integer)
- The Student class should have a method `enrollInCourse()` that allows the student to enroll in multiple courses (e.g., stored in a vector of Course objects).
- Implement a function `displayStudentDetails()` to display the student's name, ID, and the list of courses they are enrolled in.

#### 1.2 Course Class:

- The Course class should have the following properties:
  - `courseName` (string)
  - `courseCode` (string)
  - A Teacher object that is assigned to teach the course.
- Implement a method `displayCourseDetails()` to display the course details, including the assigned teacher's name and their specialization.

#### 1.3 Teacher Class:

- The Teacher class should have the following properties:
  - name (string)
  - teacherID (integer)
  - specialization (string)
- Implement a function `assignToCourse(Course &course)` to assign the teacher to a specific course.
- Implement a function `displayTeacherDetails()` to display the teacher's name, ID, and specialization.

#### 1.4 TheoryCourse and PracticalCourse:

- Both TheoryCourse and PracticalCourse should inherit from the Course class.
- The TheoryCourse class should have an additional member: `hoursPerWeek` (integer).

- The PracticalCourse class should have an additional member: labFee (double).
- Both classes should override the displayCourseDetails() method to include course-specific information:
  - For TheoryCourse, display the hours per week.
  - For PracticalCourse, display the lab fee.

### 1.5 OnlineSchool Class:

- The OnlineSchool class should manage all the students, teachers, and courses. This class should contain:
  - A vector of Student objects.
  - A vector of Teacher objects.
  - A vector of Course objects (it can hold both TheoryCourse and PracticalCourse).
- The OnlineSchool class should have methods:
  - addStudent(Student &student) to add a student.
  - addTeacher(Teacher &teacher) to add a teacher.
  - addCourse(Course &course) to add a course.
  - enrollStudentInCourse(Student &student, Course &course) to enroll a student in a course.
  - displayAllStudentsInCourse(Course &course) to list all students enrolled in a particular course.
  - displayAllCoursesOfStudent(Student &student) to display all courses in which a student is enrolled.

### Program Flow:

- Create several Student, Teacher, TheoryCourse, and PracticalCourse objects.
- Add them to the OnlineSchool system.
- Enroll students in various courses.
- Display the details of students, courses, and teachers.

### Example Output:

Student: John Doe (ID: 101)

Enrolled in courses:

- Math 101 (Theory)
- Chemistry Lab (Practical)

Course: Math 101 (Code: MTH101)

Instructor: Dr. Smith (ID: 2001), Specialization: Mathematics

Weekly Hours: 3 hours/week

Course: Chemistry Lab (Code: CHM101)

Instructor: Dr. Johnson (ID: 2002), Specialization: Chemistry

Lab Fee: \$50

