Polytechnic University of Puerto Rico
Electrical and Computer Engineering & Computer Science Department
CECS 2223 – Computer Programming II Lab

Lab 5

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1. Copy the source code developed for Lab 5 and paste it as **text** below. (*15 points*)

```
/*
* CECS 2223, Computer Programming II Laboratory
* Fall 2023
* Date: September 27, 2023
* Topic: Lab 5 - Composition and Dynamic Memory
* File name: Catalog.h
* This file declares a class named Catalog
* Complete the declaration as required.
* Name: Coral S. Schmidt Montilla, ID#148830
* Name: Aleysha M. Rivera Cores, ID#108408
*/
#pragma once
// preprocessor directives
#include "Course.h"

class Catalog {
private:
	string universityName; // the name of the university
	int courseCount; // the number of courses in the catalog
	Course** courses; // the array which contains the courses
	void sortCatalog(); // sorts the courses in the catalog in alphabetical order
public:
	Catalog(); // the default constructor
	Catalog(const Catalog&); // the copy constructor
	~Catalog(); // the destructor
	void setUniversityName(string);
	string getUniversityName() const;
	void addCourse(string, string, int); // adds a course to the catalog
	// The addCourse method calls the sortCatalog method after a course is added.
	int findCourse(const string) const; // method to find a course in the catalog
	void deleteCourse(int); // removes a course from the catalog
	void printCatalog() const; // prints the course list for the university
	// printCatalog prints the header CODE, NAME, CREDITS using the column widths
	// from the Course class
	void operator=(const Catalog&); // overload of the assignment operator
};
/*
* CECS 2223, Computer Programming II Laboratory
* Fall 2023
* Date: September 27, 2023
* Topic: Lab 5 - Composition and Dynamic Memory
* File name: Course.h
* This file declares a class named Course
```

```
* Complete the declaration as required.
* Name: Coral S. Schmidt Montilla ID#148830
* Name: Aleysha M. Rivera Cores, ID#108408
*/
#pragma once
// preprocessor directives
#include <string>
#include <iostream>

using namespace std;

class Course {
private:
	string courseCode; // the course's code, e.g. CECS 2223
	string courseName; // the course's name, e.g. Computer Programming II
Laboratory
	int credits; // the number of credits for the course
	static size_t codeSize; // the size of the courseCode field
	void setCodeSize(string, bool); // private method to set the value for
codeSize
	static size_t nameSize; // the size of the courseName field
	void setNameSize(string, bool); // private method to set the value for
nameSize
public:
	Course(); // the default constructor
	Course(string, string, int); // parameterized constructor
	// the parameterized constructor must validate the value for credits
	Course(const Course&); // the copy constructor
	~Course(); // the destructor
	void setCourseCode(string);
	void setCourseName(string);
	void setCourseCredits(int); // validates the parameter to be 0 or greater
	string getCourseCode() const;
	string getCourseName() const;
	int getCourseCredits() const;
	size_t getCodeSize() const;
	size_t getNameSize() const;
	void displayCourse() const; // prints the course data ready for a table
	// the order is course code, course name, credits, and the size of the
	// course and name fields is variable
};
/*
* CECS 2223, Computer Programming II Laboratory
* Fall 2023
* Date: September 27, 2023
* Topic: Lab 5 - Composition and Dynamic Memory
* File name: Catalog.cpp
* This file defines a class named Catalog
* Complete the declaration as required.
* Name: Coral S. Schmidt Montilla, ID#148830
* Name: Aleysha M. Rivera Cores, ID#108408
*/

#include "Catalog.h"
```

```
Catalog::Catalog() {
    universityName = "";
    courseCount = 0;
    courses = nullptr;
}

Catalog::Catalog(const Catalog& other) {
    universityName = other.universityName;
    courseCount = other.courseCount;
    if (courseCount > 0) {
        courses = new Course * [courseCount];
        for (int i = 0; i < courseCount; i++) {
            courses[i] = new Course(*(other.courses[i]));
        }
    }
    else {
        courses = nullptr;
    }
}

Catalog::~Catalog() {
    for (int i = 0; i < courseCount; i++) {
        delete courses[i];
    }
    delete[] courses;
}

void Catalog::setUniversityName(string name) {
    universityName = name;
}

string Catalog::getUniversityName() const {
    return universityName;
}

void Catalog::addCourse(string code, string name, int credits) {
    Course* newCourse = new Course(code, name, credits);

    Course** temp = courses;
    courses = new Course * [courseCount + 1];

    for (int i = 0; i < courseCount; i++) {
        courses[i] = temp[i];
    }

    courses[courseCount] = newCourse;
    courseCount++;

    delete[] temp;

    // Sort the catalog after adding the new course
    sortCatalog();
}
```

```
int Catalog::findCourse(const string code) const {
    for (int i = 0; i < courseCount; i++) {
        if (courses[i]->getCourseCode() == code) {
            return i;
        }
    }
    return -1;
}

void Catalog::deleteCourse(int index) {
    if (index >= 0 && index < courseCount) {
        delete courses[index];
        for (int i = index; i < courseCount - 1; i++) {
            courses[i] = courses[i + 1];
        }
        courseCount--;

        Course** temp = courses;
        courses = new Course * [courseCount];
        for (int i = 0; i < courseCount; i++) {
            courses[i] = temp[i];
        }
        delete[] temp;
    }
}

void Catalog::printCatalog() const {
    // Calculate the maximum code and name lengths
    size_t maxCodeLength = 0;
    size_t maxNameLength = 0;

    for (int i = 0; i < courseCount; i++) {
        size_t codeLength = courses[i]->getCourseCode().length();
        size_t nameLength = courses[i]->getCourseName().length();

        if (codeLength > maxCodeLength) {
            maxCodeLength = codeLength;
        }

        if (nameLength > maxNameLength) {
            maxNameLength = nameLength;
        }
    }

    // Print the header
    printf("University %s\n\n%-*s  %-*s  %s\n\n", universityName.c_str(),
static_cast<int>(maxCodeLength), "CODE", static_cast<int>(maxNameLength), "NAME",
"CREDITS");

    // Print course details
    for (int i = 0; i < courseCount; i++) {
```

```
        printf("%-*s  %-*s  %5d\n\n", static_cast<int>(maxCodeLength),
            courses[i]->getCourseCode().c_str(), static_cast<int>(maxNameLength),
            courses[i]->getCourseName().c_str(),
            courses[i]->getCourseCredits());
    }
}


void Catalog::sortCatalog() {
    if (courseCount <= 1) {
        return; // No need to sort if there are 0 or 1 courses
    }

    for (int i = 0; i < courseCount - 1; i++) {
        for (int j = 0; j < courseCount - i - 1; j++) {
            // Compare course names character by character
            string name1 = courses[j]->getCourseName();
            string name2 = courses[j + 1]->getCourseName();
            int minLength = min(name1.length(), name2.length());
            int k = 0;

            while (k < minLength && name1[k] == name2[k]) {
                k++;
            }

            if (k < minLength && name1[k] > name2[k]) {
                Course* temp = courses[j];
                courses[j] = courses[j + 1];
                courses[j + 1] = temp;
            }
        }
    }
}




void Catalog::operator=(const Catalog& other) {
    if (this == &other) {
        return; // Check for self-assignment
    }

    // Delete existing courses
    for (int i = 0; i < courseCount; i++) {
        delete courses[i];
    }
    delete[] courses;

    // Copy data from other Catalog
    universityName = other.universityName;
    courseCount = other.courseCount;

    // Create new courses array and copy courses
```

```
    if (courseCount > 0) {
        courses = new Course * [courseCount];
        for (int i = 0; i < courseCount; i++) {
            courses[i] = new Course(*(other.courses[i]));
        }
    }
    else {
        courses = nullptr;
    }
}
/*
* CECS 2223, Computer Programming II Laboratory
* Fall 2023
* Date: September 27, 2023
* Topic: Lab 5 - Composition and Dynamic Memory
* File name: Course.cpp
* This file declares a class named Catalog
* Complete the declaration as required.
* Name: Aleysha M. Rivera Cores, ID# 108408
* Name: Coral S. Schmidt Montilla, ID# 148830
*/

#include "Course.h"
#include <iostream>
#include <string>
#include <iomanip>
using namespace::std;

//d.constructor
Course::Course() : credits(0) {
      setCourseCode("");
      setCourseName("");

}

//p.constructor
Course::Course(string code, string name, int credits) {
      setCourseCode(code);
      setCourseName(name);
      setCourseCredits(credits);
}

//copy constructor
Course::Course(const Course& other) {
      courseCode = other.courseCode;
      courseName = other.courseName;
      credits = other.credits;
}

//destructor
Course::~Course()
{ }

//set codeSize based on courseCode
```

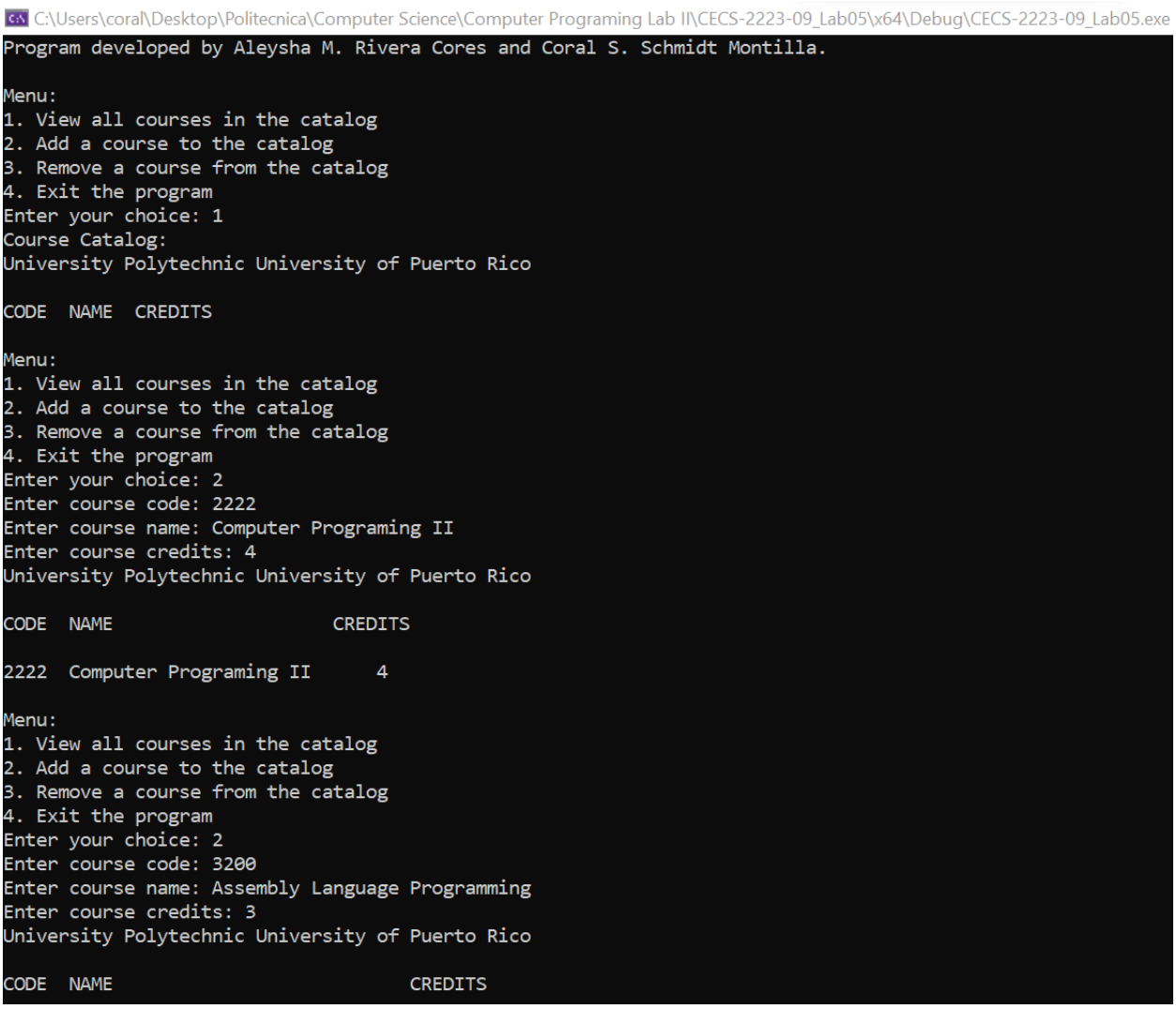
```
void Course::setCodeSize(string, bool forceUpdate) {
	if (forceUpdate || courseCode.size() > codeSize) {
		codeSize = courseCode.size();
	}
}

//nameSize based on courseName
void Course::setNameSize(string name, bool forceUpdate) {
	if (forceUpdate || name.size() > nameSize) {
		nameSize = name.size();
	}
}

//Setter for crouseCode
void Course::setCourseCode(string code) {
	courseCode = code;
	setCodeSize(code, false); //update codeize if needed
}

//Setter for courseName
void Course::setCourseName(string name) {
	courseName = name;
	setNameSize(name, false); //update nameSize if needed
}

//setter for courseCredits
void Course::setCourseCredits(int c) {
	if (c >= 0) {
		credits = c;
	}
	else {
		cout << "Invalid credits value. Setting to 0." << endl;
		credits = 0;
	}
}

//Getter for courseCode
string Course::getCourseCode() const {
	return courseCode;
}

//Getter for courseName
string Course::getCourseName() const {
	return courseName;
}

//Getter for courseCredits
int Course::getCourseCredits() const {
	return credits;
}

//Getter for codeSize
size_t Course::getCodeSize() const {
	return codeSize;
```

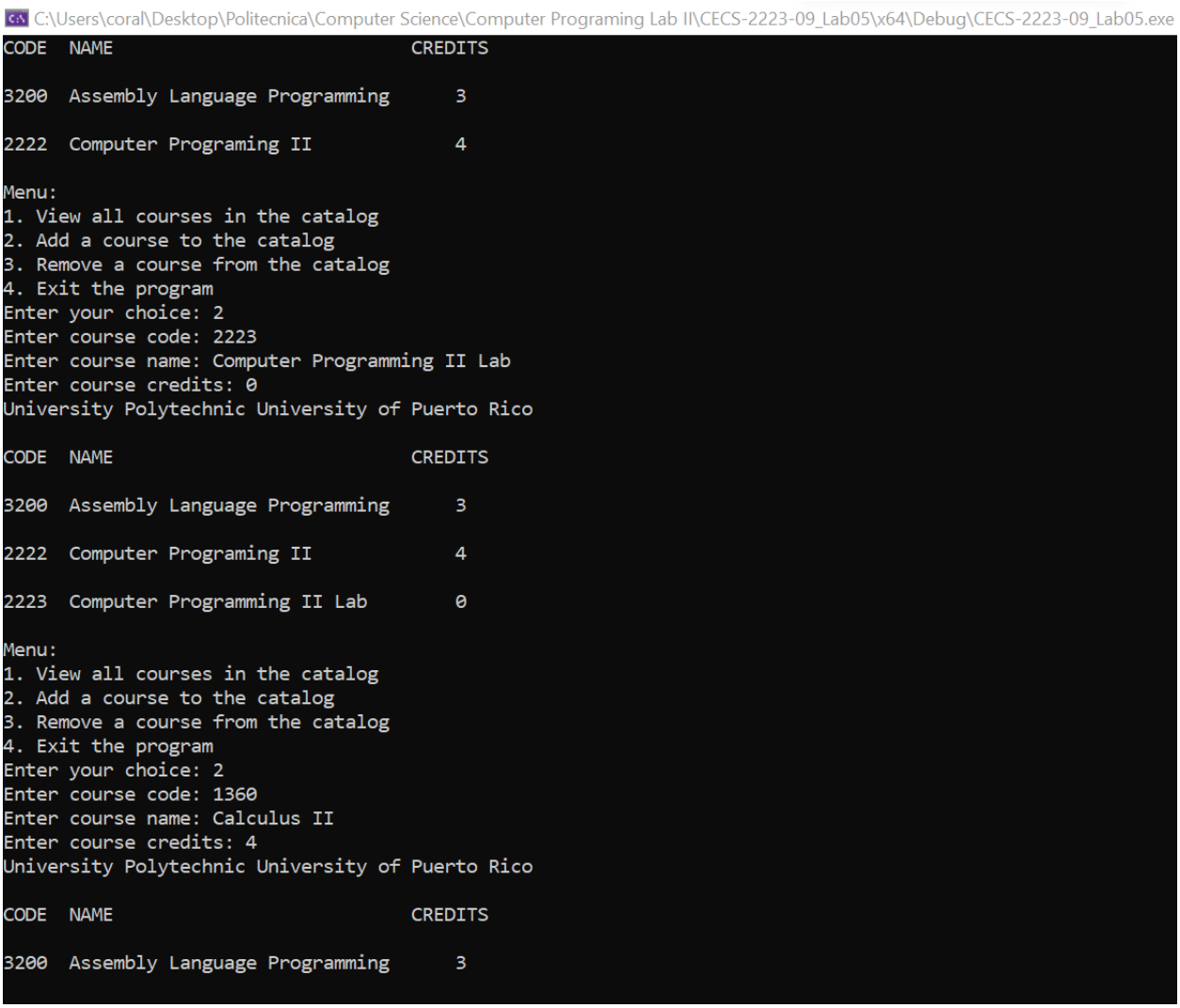
```
}

//Getter for nameSize
size_t Course::getNameSize() const {
	return nameSize;
}


//Display course info
void Course::displayCourse() const {
	cout << left << setw(codeSize) << courseCode << " | "
		<< setw(nameSize) << courseName << " | " << setw(10) << credits <<
endl;
}
/*
* CECS 2223, Computer Programming II Laboratory
* Fall 2023
* Date: September 27, 2023
* Topic: Lab 5 - Composition and Dynamic Memory
* File name: lab05.cpp
* This file implements a class named Catalog
* Complete the code as required.
* Name: Aleysha M. Rivera Cores, ID# 108408
* Name: Coral S. Schmidt Montilla, ID# 148830
*
* To test your code, add at least 4 courses to the catalog, and remove at least 2.
* Start by selecting the option to print the catalog, then proceed to add courses,
* and finally remove courses. You should print the course list after every add or
* remove action.
*/

// preprocessor directives
#include "Catalog.h"
#include <iostream>
#include <string>
#include <iomanip>
using namespace std;

// Initialize static variables
size_t Course::codeSize = 0;
size_t Course::nameSize = 0;
string code, name;
int credits;

int menu() {
    int option = 0;
    cout << "Menu:" << endl;
    cout << "1. View all courses in the catalog" << endl;
    cout << "2. Add a course to the catalog" << endl;
    cout << "3. Remove a course from the catalog" << endl;
    cout << "4. Exit the program" << endl;
    cout << "Enter your choice: ";
    cin >> option;
    return option;
```

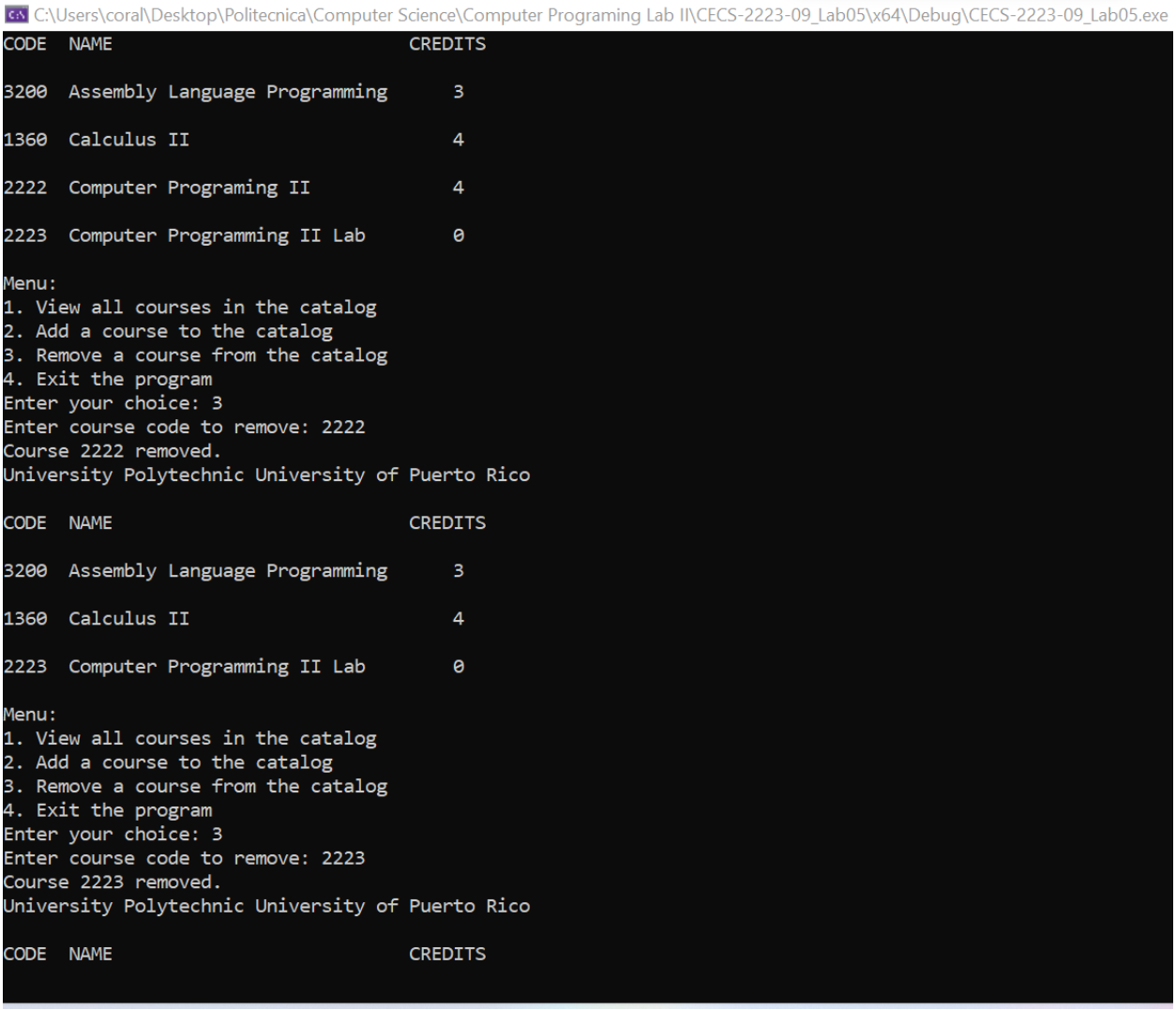
```
}

bool execute(Catalog& catalog, const int option) {
    switch (option) {
    case 1:
        cout << "Course Catalog:" << endl;
        catalog.printCatalog();
        break;

    case 2: {

        cout << "Enter course code: ";
        cin >> code;
        cout << "Enter course name: ";
        cin.ignore();
        getline(cin, name);
        cout << "Enter course credits: ";
        cin >> credits;
        catalog.addCourse(code, name, credits);
        catalog.printCatalog();
    } break;

    case 3: {
        cout << "Enter course code to remove: ";
        cin >> code;
        int index = catalog.findCourse(code);
        if (index != -1) {
            catalog.deleteCourse(index);
            cout << "Course " << code << " removed." << endl;
        }
        else {
            cout << "Course " << code << " not found in the catalog." << endl;
        }
        catalog.printCatalog();
    } break;

    case 4:
        return false; // Exit the program
    default:
        cout << "Invalid option. Please choose a valid option from the menu." <<
endl;
    }
    return true;
}

void personalInfo() {
    cout << "Program developed by Aleysha M. Rivera Cores and Coral S. Schmidt
Montilla." << endl << endl;
}

int main() {
    Catalog poli;
    poli.setUniversityName("Polytechnic University of Puerto Rico");
```

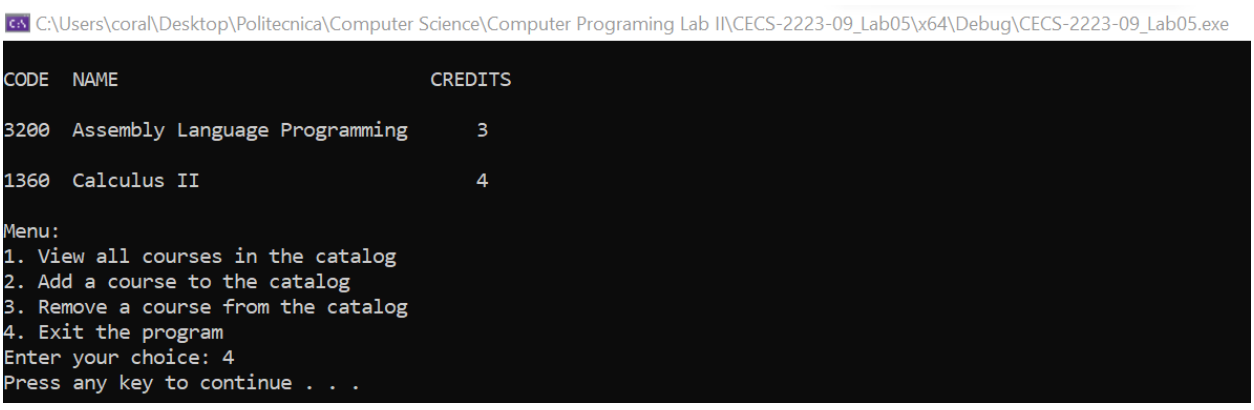
```
    personalInfo();

    int option;
    do {
        option = menu();
    } while (execute(poli, option));

    system("pause"); // For Visual Studio use only!
    return 0;
}


// declare a Catalog object name poli

// Assign the string Polytechnic University of Puerto Rico as the name for poli

// develop a while iteration control structure which uses the return value of the
// execute method as sentinel. The execute method receive the reference to poli
// and the return value of menu as parameters.
// This must be a single line of code!
  //  while ();


// The menu method presents the user with a list of options. They are:
// 1. View all courses in the catalog
// 2. Add a course to the catalog
// 3. Remove a course from the catalog
// 4. Exit the program
// Declare the local integer variable option and initialize if to 0
// This method DOES NOT validate the value received by the user,
// it only returns such value.

// The execute method implements a switch selection control structure to
// implement the menu option. It's parameters are a reference to a Catalog
// object and an integer representing the option selected by the user.
// The method returns false only when the option value is 4, true otherwise.
// The default case catches invalid option values and requires an error
// message to be printed.

// The personalInfo method prints the phrase
// Program developed by [name of student 1] and [name of student 2].
// make sure to add an empty line after the phrase is printed.
```

2. Paste the screenshots of the program's execution below. (*5 points*)

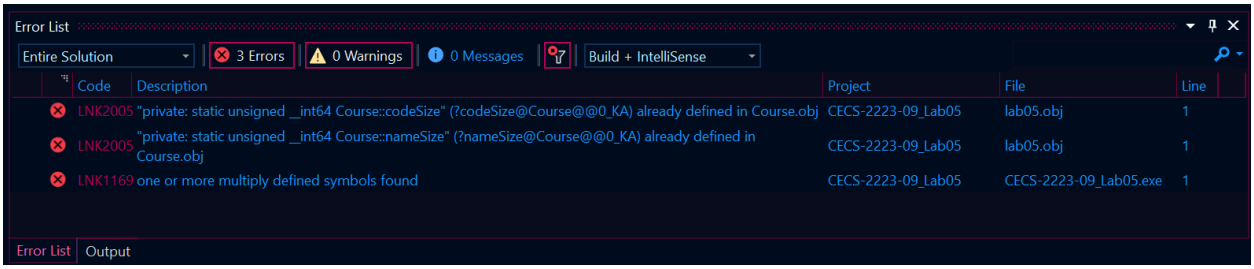



C:\Users\coral\Desktop\Politecnica\Computer Science\Computer Programing Lab II\CECS-2223-09_Lab05\x64\Debug\CECS-2223-09_Lab05.exe
CODE NAME CREDITS
3200 Assembly Language Programming 3
2222 Computer Programing II 4
Menu:
1. View all courses in the catalog
2. Add a course to the catalog
3. Remove a course from the catalog
4. Exit the program
Enter your choice: 2
Enter course code: 2223
Enter course name: Computer Programming II Lab
Enter course credits: 0
University Polytechnic University of Puerto Rico
CODE NAME CREDITS
3200 Assembly Language Programming 3
2222 Computer Programing II 4
2223 Computer Programming II Lab 0
Menu:
1. View all courses in the catalog
2. Add a course to the catalog
3. Remove a course from the catalog
4. Exit the program
Enter your choice: 2
Enter course code: 1360
Enter course name: Calculus II
Enter course credits: 4
University Polytechnic University of Puerto Rico
CODE NAME CREDITS
3200 Assembly Language Programming 3


C:\Users\coral\Desktop\Politecnica\Computer Science\Computer Programing Lab II\CECS-2223-09_Lab05\x64\Debug\CECS-2223-09_Lab05.exe
CODE NAME CREDITS
3200 Assembly Language Programming 3
1360 Calculus II 4
2222 Computer Programing II 4
2223 Computer Programming II Lab 0
Menu:
1. View all courses in the catalog
2. Add a course to the catalog
3. Remove a course from the catalog
4. Exit the program
Enter your choice: 3
Enter course code to remove: 2222
Course 2222 removed.
University Polytechnic University of Puerto Rico
CODE NAME CREDITS
3200 Assembly Language Programming 3
1360 Calculus II 4
2223 Computer Programming II Lab 0
Menu:
1. View all courses in the catalog
2. Add a course to the catalog
3. Remove a course from the catalog
4. Exit the program
Enter your choice: 3
Enter course code to remove: 2223
Course 2223 removed.
University Polytechnic University of Puerto Rico
CODE NAME CREDITS


C:\Users\coral\Desktop\Politecnica\Computer Science\Computer Programing Lab II\CECS-2223-09_Lab05\x64\Debug\CECS-2223-09_Lab05.exe
CODE NAME CREDITS
3200 Assembly Language Programming 3
1360 Calculus II 4
Menu:
1. View all courses in the catalog
2. Add a course to the catalog
3. Remove a course from the catalog
4. Exit the program
Enter your choice: 4
Press any key to continue . . .

3. Comment on any warnings or errors revealed by Visual Studio. If any error messages were present, list the error and describe how you corrected it. If no errors or warnings were revealed, comment on the most important aspect of developing the solution. (*5 points*)



We fixed it by eliminating:

```
size_t Course::codeSize = 0;
size_t Course::nameSize = 0;
```

From Course.cpp