# REGIS UNIVERSITY

## COLLEGE OF COMPUTER & INFORMATION SCIENCES

## Course Syllabus

**Course Number:** CS 390
**Course Title:** Principles of Programming Languages

## Course Description

Introduces the constructs upon which contemporary programming languages are based. Students investigate programs written in declarative and imperative programming languages including functional, logic, structured, and object-based approaches

## Prerequisite Courses

CS 202 and CS 310

## Course Overview

Three underlying *themes* are used to organization the topics and outcomes in this course. The *General Principles* theme focuses on the fundamental concepts associated with programming languages. The *Programming* theme focuses on implementing programs using different programming paradigms. Finally, the *Formal Theory* theme focuses on the language syntax, semantics, and pragmatics from which the General Principles derive.

## Course Outcomes

Upon completion of this course, students should be able to (in no particular order):

1. Describe distinguishing characteristics of declarative (functional & logical) and imperative (procedural & object-oriented) programming language paradigms and explain how these characteristics manifest in historic and contemporary programming languages.

2. Evaluate syntactic, semantic, and pragmatic tradeoffs among the various programming paradigms and programming languages

3. Describe the function of Language Processing Components (e.g. Scanner, Parser, etc.)

4. Summarize the history and continuing evolution of programming languages and explain the need to continuously learn new languages throughout your career

5. Demonstrate different forms of declaration, typing, binding, visibility, scoping, and lifetime management for various programming language constructs (e.g. variables, functions, data structures including objects, etc.)

6. Use formal systems, including Formal Language Descriptions, Lambda Calculus, and Denotational Semantics, to explain and model various programming language concepts

7. Develop, analyze, and compare programs written in the various Programming Paradigms

8. Choose an appropriate programming language solution for a given programming task

## Course Materials

### *Required Text:*

Scott, M. L., (2016). *Programming language pragmatics* (4th ed.). Waltham, MA: Morgan Kaufman.

Supplementary Textbook Chapters at: booksite.elsevier.com/9780124104099

### *Technology Tools:*

1. A PC-compatible computer system running a version of the Windows operating system with administrator rights to install new software. Most assignments, but not all, can be completed with a Mac OS computer.

http://www.regis.edu/Academics/Learning-Management-System/System-Requirements.aspx

2. Python, SWA Prolog, Glasgow Haskell, Regis Model Assembler (Windows only), NetBeans with Java, DevC++ IDE, OCaml.

## Pre-Assignment:

Sign on to WorldClass and become familiar with the course shell navigation. Complete the Topic 1 textbook and Worldclass reading Assignments.
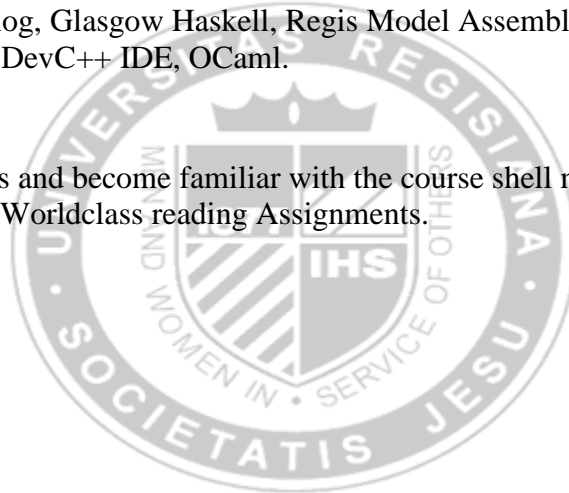
## Course Assignments and Activities (specific due dates provided by faculty)

| Week 15 | Week 8 | Topics | Readings (Text/Worldclass) | Assessed Assignments |
|---|---|---|---|---|
| 1 | 1 | **1:** Foundations<br>**2:** The Imperative Paradigm:<br>– C Programming Language | Txt: Chapter 1<br>Txt: 8.1, 8.5, 9.1–9.3<br>WC: Topic 2 | Topic 1 (assessed in exams)<br>Topic 2 Assignment (6%)<br>Participation (0.5%) |
| 2 | | | | Participation (0.5%) |
| 3 | 2 | **3:** Language Processing Systems<br>– Scanning | Txt: 2.1–2.2<br>WC: Topic 3 Part I | Topic 3.I Assignment (5%)<br>Participation (0.6%) |
| 4 | | – Topic 2 continued –<br>– Parsing | Txt: 2.3.1–2.3.4<br>WC: Topic 3 Part II | Topic 3.II Assignment (6%)<br>Participation (0.6%)<br>(assessed in exams) |
| 5 | 3 | – Topic 2 continued –<br>– Formal Languages | Txt: 2.4.1 – 2.4.3<br>WC: Topic 3 Part III | (assessed in exams)<br>Participation (0.6%) |
| 6 | | – Topic 2 continued –<br>– Static Semantics | Txt: 4.1–4.4 4.6<br>WC: Topic Part IV | Topic 3.IV (5%)<br>Participation (0.6%) |
| 7 | 4 | **4:** The Low-level Paradigm<br>– Assembly Language | WC: Topic 3 | Topic 4 Assignment (5%)<br>Participation (0.5%) |
| 8 | | **5:** Life Cycle, Naming, Scope | Txt: 3.1 – 3.6<br>W: Topic 4 | **Midterm** (15%)<br>Participation (0.5%) |
| 9 | 5 | **6:** The Functional Paradigm<br>– The OCaml Language | Txt: 8.6, 11.1 – 11.6<br>WC: Topic 5.I | Topic 6 Assignments (6%)<br>Participation (0.5%) |
| 10 | | – Topic 5 continued –<br>– Lambda Calculus | Txt: 11.7<br>WC: Topic 5.II | Participation (0.5%) |
| 11 | 6 | **7:** Dynamic Semantics | WC: Topic 7 | Topic 7 Assignments (5%)<br>Participation (0.5%) |
| 12 | | **8:** Type Systems | Txt: 7.1 – 7.4<br>WC: Topic 8 | Topic 8 Assignments (5%)<br>Participation (0.5%) |
| 13 | 7 | **9:** The Logic Paradigm<br>– The Prolog Language | Txt: 12.1-2, 12.4-5<br>WC: Topic 9 | Topic 9 Assignments (5%)<br>Participation (0.5%) |
| 14 | | – Topic 9 continued –<br>– Theoretical Foundations<br>**10:** Advanced Object-Oriented | Txt: 12.3<br>Txt: 10.4, 10.6<br>WC: Topic 10 | Participation (0.5%)<br><br>Topic 10 Assignment (4%) |
| 15 | 8 | **11:** Scripting Languages<br>– Shells and Javascript | Txt: 14.1 – 14.5<br>WC: Topic 11 | Topic 11 Assignment (5%)<br>Participation (0.6%)<br>**Final Exam** (20%) |

| | | Total | 100% |
|---|---|---|---|

**Summary of Assignments and Percentage Weight towards course grade**

| Assignment | Value (percent of overall course grade) |
|---|---|
| Topic Assignments (11 assignments, see above) | 57 % |
| Exams (midterm 15%, Final 20%) | 35 % |
| Participation | 8 % |
| *Course Total* | 100 % |

### *Late Assignment Policy for Assignments*
Late assignments will be graded and then 2% will be deducted for each day the assignment is late, *up to 5 days late*. Therefore, any assignment turned in more than *5 days* late will be given a grade of **zero**, and no feedback may be given.

### *Additional Assessment*

The CS department reserves the right to individually assess a student's knowledge of any course material using additional assessment tools (e.g. oral examination, face-to-face, skype, phone …).

### *Exams*
There will be a midterm and a final exam. Exam questions will be cumulative, taken from reading course content and assignments. Some topical material including reading assignments may be assessed only within the exams. Exams will **not** be accepted late.

### *Participation*
Class participation/effort is important because we can all learn from each other. Your participation points can make a difference in the final grade. Participation means:

1. a. Present in class every session (classroom)
   b. Present in the forum every week (online)
2. a. Effectively responds to questions from the faculty (classroom and online)
   b. Regularly checks the forum and posts all required items by the deadlines (online)
3. Appropriately interacts/replies to other students in classroom/forum discussions.

See Faculty Syllabus for participation points distribution and specific due dates

## Course Policies and Procedures

### *Adding this course during the Drop/Add Period*

If you add this course during the drop/add period, you are responsible for *immediately* notifying the instructor that you joined the course late. None of the course due dates will be extended for you. If a due date has already passed when you add the course, late points will be deducted. You may be required to complete alternative assignments assessing the same outcomes.

## Repeating the course

If you are repeating this course (due to a previous withdraw or low grade), you are responsible for *immediately* notifying the instructor. If any of the course assignments have not changed since last time you took the course, you may be required to complete alternate assignments.

## Academic Integrity, Plagiarism, Cheating

Plagiarism includes submitting any work obtained from another person, publication, or any internet web source, as your own. *All work submitted in CS390 must be your own.*

Distributing any Regis University or faculty course material, without prior written authorization, including uploads to the Internet outside of using the Worldclass shell for its intended purpose, constitutes an Academic Integrity violation, which may result in expulsion from the university.

In cases of suspected Academic Integrity violations, the instructor will discuss the matter with the student(s) involved. The instructor reserves the right to question any student orally or in writing about any assignment, and to use the evaluation of the student's understanding of this additional assessment, and of the submitted solution, as evidence of Academic Integrity violations. Faculty are **required** to report any Academic Integrity violation to the Computer Science department and the CC&IS Academic Integrity Board for possible further actions/sanctions, which may include failure of an assignment, failure of the course, suspension from the program, expulsion from the CC&IS college, and recommendation for expulsion from the university.

## Additional Faculty Course Policies

The faculty may impose additional syllabus changes that are consistent with university policies.

## CC&IS Grading Scale

| Letter Grade | Percentage | Grade Point |
|:---:|:---:|:---:|
| A | 93 to 100 | 4.00 |
| A− | 90 to less than 93 | 3.67 |
| B+ | 87 to less than 90 | 3.33 |
| B | 83 to less than 87 | 3.00 |
| B− | 80 to less than 83 | 2.67 |
| C+ | 77 to less than 80 | 2.33 |
| C | 73 to less than 77 | 2.00 |
| C− | 70 to less than 73 | 1.67 |
| D+ | 67 to less than 70 | 1.33 |
| D | 63 to less than 67 | 1.00 |
| D- | 60 to less than 63 | .67 |
| F | Less than 60 | 0 |

*Additional information about grading can be found in the latest edition of the*

## CC&IS Policies and Procedures

Each of the following CC&IS Policies & Procedures is incorporated here by reference. Students are expected to review this information each term, and by taking this course agree to the policies and procedures, as identified in this syllabus, and as specified in the latest edition of the University Catalog and the edition when they enrolled in the program, the former is available at http://www.regis.edu/Academics/Course%20Catalog.aspx or at the link provided.

- The CC&IS Academic Integrity Policy.

- The Student Honor Code and Student Standards of Conduct.

- Incomplete Grade Policy, Pass / No Pass Grades, Grade Reports.

- The Information Privacy policy and FERPA. For more information regarding FERPA, visit the U.S. Department of Education.

- The HIPPA policies for protected health information. The complete Regis University HIPAA Privacy & Security policy can be found here: http://www.regis.edu/About-Regis-University/University-Offices-and-Services/Auxiliary-Business/HIPAA.aspx.

- The Human Subjects Institutional Review Board (IRB) procedures. More information about the IRB and its processes can be found here: http://regis.edu/Academics/Academic-Grants/Proposals/Regis-Information/IRB.aspx.

The CC&IS Policies & Procedures Syllabus Addendum summarizes additional important policies including, Diversity, Equal Access, Disability Services, and Attendance & Participation that apply to every course offered by the College of Computer & Information Sciences at Regis University.

A copy of the CC&IS Policies & Procedures Syllabus Addendum can be found here: https://in2.regis.edu/sites/ccis/policies/Repository/CCIS%20Syllabus%20Addendum.docx.