

SECTION A-IV: NEW COURSE
Department of Computer and Information Science

Date of departmental approval: April 12, 2016

Effective date: Fall, 2017

First offering: Fall, 2018

CISC 3142 Programming Paradigms in C++
3 hours; 3 credits

Bulletin Description

An introduction to C++ and its roles providing support for object-oriented programming, generic programming, procedural programming, and low-level programming. The C++ memory model, and topics in explicit memory management. Storage classes, scope, and compilation stages. The Standard Template Library. Comparison with Java. (Not open to students who have completed 3110.)

Prerequisites: CISC 3115, CISC 3130 and CISC 3310

Contact hours: 3

Frequency of Offering: every semester

Projected enrollment: 2 sections of 30 students annually

Clearances: None

Rationale: With the adoption of Java as the introductory programming language in the program, students need an opportunity to study the C/C++ end of the programming language spectrum. This course builds on their knowledge of object oriented programming in Java, the facility with data structures and their knowledge of architecture to give them a level of sophistication in C++ programming that was heretofore unattainable.

Department Goals Addressed by Course:

1. Prepare students computer science majors for the full range of software development opportunities in the professional programming world.
2. Give students a broad insight into the various programming paradigms and environments of contemporary importance.

Objectives of Course:

1. Understand C++ and the use of and consequences of objects-as-values and direct access to memory management facilities.
2. Adept, efficient C++ programming.
3. Increased insight into programming paradigms in general and object-oriented programming in particular, as this second in depth study of an OOP language takes place.
4. Gain further insight into machine architecture and system organization through the use of this relatively low-level language.

Outcomes Anticipated for Course: At the completion of this course, students will be able to:

1. Develop significant, efficient, flexible C++ application programs
2. Compare and contrast Object-Oriented programming in C++ and Java
3. Speak knowledgeably of the different programming paradigms.

Course Outline:

1. C++ Functions, storage classes, and separate compilation. [1 week]
2. The procedural programming paradigm. [1 week]
3. Class definitions (including comparison with Java, constructors, member initialization, data members, member functions, interface vs. implementation, inline functions, static members). [2 weeks].
4. Operator overloading; non-member vs. member operators; friends. [1 week]
5. Pointers and dynamic storage allocation; pointers vs. references; pointers and arrays. [1 week]
6. Low-level programming and pointer arithmetic: C-strings, struct, and union. [1 week]
7. Memory management (new and malloc). [1 week]
8. Canonical class form (copy constructor, assignment operator, and destructor); the string class. [1 week]
9. Generic programming (templates, constrained and unconstrained generics, effect of generics on .h/.cpp files). [1 week]
10. The Standard Template Library. [2 weeks]
11. Object-oriented programming (inheritance, polymorphism, abstract classes, multiple inheritance, run-time type information (RTTI)). [1 week]
12. I/O and exception handling. [1 week]
13. Final Exam (cumulative).

Total 15 Weeks

Method of evaluation:

Exams and Quizzes

Final Exam

Homework Assignments and Labs

Method of assessment: The department's general assessment methodology will be applied to this course. This involves selecting a subset of questions from the final exam and assess the student answers in light of overall departmental learning objectives.

Bibliography:

C++ Primer, Fifth edition, Lippman, Lajoie & Moo, Addison-Wesley Professional, 2012, 978- ISBN-13: 0321714114

The C++ Programming Language, Fourth edition, Stroustrup, Addison-Wesley Professional, 2013, ISBN-13: 978-0321563842

Effective C++: 55 Specific Ways to Improve Your Programs and Designs, Third edition, Meyers, Addison-Wesley Professional, 2005, ISBN-13: 978-0321334879

The C++ Standard Library: A Tutorial and Reference, Second edition, Josuttis, Addison-Wesley Professional, 2012, ISBN-13: 978-0321623218