



Madrid
SAINT LOUIS UNIVERSITY
THE AMERICAN JESUIT UNIVERSITY IN SPAIN

Saint Louis University–Madrid Campus

Division of Sciences, Engineering and Nursing

CSCI–2100 Data Structures

Javier Gamo Aranda

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Credits: 4 **Semester:** Fall 2017

Days: MTWR 5:30 pm - 6:20 pm

Lecture Room: PAH 19

Office Hours: Wednesdays from 6:30pm to 7:30pm and **upon request.**

Office Room: PAH-202

Please make sure to take advantage of office hours, as they offer a wonderful opportunity for individual interaction.

Add/Drop period: Last day to drop: Sep. 17. Last day to drop with W: Oct. 30

Prerequisite: A grade of “C–” or better in CSCI 1300/150: Introduction to Object-Oriented Programming and concurrent enrollment in MATH 1660/135 Discrete Mathematics. Curriculum: general elective, A&S/B&A, core requirement, computer science and engineering.

Course Description

Relevant issues in writing a “good” program is the choice of the data structure. Design, analysis and implementation of “efficient” and “adaptable” programs, with emphasis on data structure and data representation are the main objective of this course. The course will reinforce concepts of Object Oriented Programming like abstraction, encapsulation, modularity, and reusability using C++ Programming Language. Since the majority of students will enter this course having used Python in CSCI 1300/150, we do not assume any familiarity with C++ at the onset of this course.

Course Objectives

On successful completion of this module, students should be able:

- To review the ideas of computer science, programming, and problem–solving.
- To understand the key concept of abstraction, encapsulation, modularity, in (object oriented) programming and the role they in the problem–solving process.
- To evaluate and choose appropriate data structures and algorithms for a range of programming problems. Data Structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs are thought and programs are written to implement them.
- To design and implement significant programs in C++.

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Learning Outcomes

Following this course, students will be able to:



1. Write programs using object-oriented design principles with C++.
2. Choose the appropriate data structure and algorithm design method for a specified application.
3. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
4. Solve problems using algorithm design methods, backtracking and writing programs for these solutions.
5. Function on multidisciplinary teams.
6. Communicate effectively.
7. Recognize the need for, and engage in life-long learning.
8. Develop a knowledge of contemporary issues.
9. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbook & Programming tools

Data Structures and Algorithms in C++ (Second Edition) by Michael T. Goodrich, Roberto Tamassia and David M. Mount. John Wiley & Sons, 2011.

The following books could be consulted for different approaches or for further information:
C++ How to Program by Harvey M. Deitel and Paul J. Deitel. Prentice Hall Computer Books, 2000.
Data Structures & Algorithm Analysis in C++ by Mark Allen Weiss. Addison-Wesley, 1998.

Additional Online Material:

<http://www.cplusplus.com/>

<https://www.tutorialspoint.com/cplusplus/>

Programming tools:

Eclipse IDE for C/C++ Developers (recommended)

<http://www.eclipse.org/downloads/packages/eclipse-ide-cc-developers/neon3>

On-line C++ editor & compiler tools:

C++ shell

<http://cpp.sh/>

Ideone

<https://ideone.com/>

Grading System

The grade will be obtained from the following areas:

- Homework: 15%
- Project: 15%
- Mid-Term Exam(s): 35%
- Final exam: 35%



Extra Credit

Programming assignments given in class will generally include a small extra credit challenge.

Policy on Programming Projects:

Programming projects are due on the day specified when they are assigned. **Late submissions will be penalized at the rate of 20% per day.** Copied projects will not be accepted. Projects will be graded in the manner shown below.

| | % Allocated |
|-----------------------|-------------|
| Program Documentation | 10 |
| Compilation | 50 |
| Execution | 40 |
| Total | 100 |

Grading scale

100 > A > 90% ,
89% > A- > 87%
86% > B+ > 84%
83% > B > 80%
79% > B- > 77%
76% > C+ > 74%
73% > C > 70%
69% > C- > 66%
65% > D > 60%
F < 60%

Note: The grading system may be adjusted as needed at the discretion of the instructor.

VIII Academic Honesty Cheating in class on quizzes, homework and tests is a serious offense. Any student caught cheating will receive an F for the course. A student may also be suspended for one semester. For more information concerning academic dishonesty, refer to:

http://spain.slu.edu/academics/academic_advising/docs/Academic_integrity.pdf

Policies

- (1) Students are encouraged to participate in class discussions and to ask questions.
- (2) Announcements may be made during the semester.
- (4) Syllabus, reading and homework problems are subject to change.
- (5) Students are responsible for all lecture material, handouts, homework and assigned reading.
- (6) It is mandatory to attend all classes unless a reasonable excuse is given.
- (7) Make up exams are not given. Students who legitimately miss an exam, due to a doctor's visit or family emergency must provide written documentation of the circumstances. A letter from the university counselor is accepted. Exams that are missed illegitimately result in a score of F. Grades for these students will be based on the remaining exams. Missing more than one exam results in an F grade.



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Students with Disabilities

Any student who qualifies for special accommodations, due to presence of a disability, and feels it necessary to utilize them in order to meet the requirements of this course—as outlined in the syllabus, should contact Counseling/Disability Services. Please send an e-mail to counselingcenter-madrid@slu.edu

Students may also stop by the Counseling/Disabilities Services office in the Padre Rubio building. Confidentiality will be observed in all inquiries.

Title IX Syllabus Statement

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858 ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858 ext. 230) or Sineus Multipletherapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sineus.es; 91-700-1979) To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address: http://spain.slu.edu/student_life/docs/SLUMadridSexualMisconductPolicy.pdf.



Course Outline (tentative)

| Week | Start | End | Topic | Activities | | | | |
|------|--------|--------|---|-----------------------|---------------|-------|----------|-------|
| | | | | Name | Display after | Hour | Due time | Hour |
| 1 | 4-Sep | 7-Sep | Introduction to C++ Environment – C++ compiler – C++ main, variables, input/output | Homework 1 | 4-Sep | 9:00 | 11-Sep | 15:30 |
| 2 | 11-Sep | 14-Sep | – Simple variables, Arrays, C- string – Variable lifespan and scope – Pointers and Dynamic Memory | Homework 2 | 11-Sep | 9:00 | 18-Sep | 15:30 |
| 3 | 18-Sep | 21-Sep | Control Structure – Expressions, operators, evaluation, precedence. – if, for, while, do while statements | Homework 3 | 18-Sep | 9:00 | 25-Sep | 15:30 |
| 4 | 25-Sep | 28-Sep | Functions – Defining and calling functions – Function Overloading – Recursive Functions – Function Template – Programs Organization & Generic Programming (Separate compilation) | Homework 4 | 25-Sep | 9:00 | 2-Oct | 15:30 |
| 5 | 2-Oct | 5-Oct | Introduction to Abstract Data Types (ADT) – Structures – Classes – Programming with classes: Case Studies | Project 1 | 4-Sep | 9:00 | 13-Oct | 15:30 |
| 6 | 9-Oct | 12-Oct | Linear Structure: specification, representation and implementation. – Lists – Stacks | Homework 5 | 9-Oct | 9:00 | 16-Oct | 15:30 |
| 7 | 16-Oct | 19-Oct | – Queues – Linked Representation | FIRST MIDTERM EXAM * | 11-Oct | 17:30 | 18:20 | |
| 8 | 23-Oct | 26-Oct | Priority Queue Trees – Heap Representation and implementation | Homework 6 | 13-Oct | 9:00 | 6-Nov | 15:30 |
| 9 | 30-Oct | 2-Nov | Tree Abstract Data Type – Properties – Representation & Implementation – Traversal Technics – Applications | Homework 7 | 6-Nov | 9:00 | 20-Nov | 15:30 |
| 10 | 6-Nov | 9-Nov | Search Trees – Properties | Project 2 | 6-Nov | 9:00 | 20-Nov | 15:30 |
| 11 | 13-Nov | 16-Nov | – Representation & Implementation – Applications | SECOND MIDTERM EXAM * | 15-Nov | 17:30 | 18:20 | |
| 12 | 20-Nov | 23-Nov | Graphs | Homework 8 | 20-Nov | 9:00 | 27-Nov | 15:30 |
| 13 | 27-Nov | 30-Nov | – Properties | Homework 9 | 4-Dec | 9:00 | 22-Dec | 15:30 |
| 14 | 4-Dec | 7-Dec | – Representation & Implementation | Project 3 | 20-Nov | 9:00 | 22-Dec | 15:30 |
| 15 | 11-Dec | 14-Dec | – Applications | Extra Credit 1 | 17-Oct | 9:00 | 16-Nov | 15:30 |
| 16 | 18-Dec | 21-Dec | FINAL EXAM * | | 20-Dec | 15:30 | 18:30 | |

* Exam dates might change. Final dates will be announced on due time