INTER-AMERICAN UNIVERSITY OF PUERTO RICO
METROPOLITAN ENCLOSURE
FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCES AND MATHEMATICS
Computer Science Program

SYLLABUS

I. GENERAL INFORMATION

COURSE TITLE	**:**	**DATA STRUCTURE**
Code and number	**:**	**COMP 2900**
Credits	**:**	**Three (3)**
Academic term	**:**	
Professor	**:**	
Office hours	**:**	
Office telephone	**:**	
Email	**:**	

II. DESCRIPTION

Analysis of problem solving with abstract data types. Application of linear and non-linear data structures and techniques for data management, such as: recursive processes and search and sort algorithms. Analysis of the efficiency of algorithms. It requires 45 hours of conference-laboratory. Requirements: COMP 2400 and 2501.

Competence:
Design and implement programs in high-level languages.

III. OBJECTIVES

It is expected that upon completion of the course, the student will be able to:

1. Select the appropriate data structures to store and organize data collections so that they can be used efficiently.
2. Analyze algorithms to order and search linear and nonlinear data structures.
3. Develop solutions to organize, order, and search linear and non-linear data structures.
4. Show a critical and creative attitude towards the development of programs using data structures.

IV. THEMATIC CONTENT

A. Introduction to the basics of data structures
   1. Modular design and data functionalities
   2. Abstract Data Types

3. Efficiency of algorithms
4. Big-O notation

B. Linear Structures (“Vectors”)

1. Lists
2. Stacks
3. Tails (“Ques”)
4. Recursion
    a. List traversing

C. Sorting Algorithms
    1. Non-recursive
        a. Bubble Sort
        b. Selection Sort
        c. Insertion Sort
    2. Recursive
        a. Merge Sort
        b. Heap Sort
        c. Quick Sort

D. NO linear Structures
    1. Pointers
    2. Linked Lists
        a. Singles
        b. Circular
        c. Doubles
    3. Trees
        a. Binary Trees
        b. Binary Heaps
    4. Graphs

E. Search Algorithms
    1. Hash Tables
        a. Open Hashing (or Close Addressing)
        b. Open Addressing (or Close Hashing)
    2. Search Algorithms
        a. Linear Search
        b. Binary Search
        c. Depth-First Search

d. Breadth-First Search

V. ACTIVITIES

1. Lectures by the teacher
2. Practice exercises
3. Discussion of readings and exercises
4. Application exercises
5. Self-assessment
6. Collaborative work

VI. EVALUATION

Criterion	Punctuation	% of Final Grade
Exam #1	100	30
Exam #2	100	30
Exam #3	100	30
Homework	100	10
Total	400	100

VII. SPECIAL NOTES

A. Auxiliary services or special needs
All students requiring auxiliary services or special assistance must request them at the beginning of the course or as soon as they acquire knowledge of their needs, through the corresponding register, in the Orientation Program.

B. Honesty, fraud and plagiarism
The lack of honesty, fraud, plagiarism and any other inappropriate behavior in relation to academic work constitute major infractions sanctioned by the General Student Regulations. Major infractions, as provided in the General Student Regulations, may result in the suspension of the University for a defined period of more than one year or permanent expulsion from the University, among other sanctions.

C. Use of electronic devices
Cell phones and any other electronic device that could disrupt teaching and learning processes or alter the environment conducive to academic excellence will be disabled. The pressing situations will be addressed, as appropriate. The use of electronic devices that allow accessing, storing or sending data during evaluations or examinations is prohibited.

D. Compliance with the provisions of Title IX
The Federal Higher Education Act, as amended, prohibits discrimination on the basis of gender in any academic, educational, extracurricular, athletic or any other program or employment, sponsored or controlled by a higher education institution regardless of whether it is performed inside or outside the premises of the institution, if the institution receives federal funds.

As provided by the current federal regulations, a Title IX Assistant Coordinator has been designated in our academic unit to provide assistance and guidance in relation to any alleged incident constituting discrimination based on sex or gender, sexual harassment or sexual assault. You can contact the Auxiliary Coordinator at telephone 787 250-1912, extension 2262, or email griverar@metro.inter.edu
The Normative Document entitled Rules and Procedures to Address Alleged Violations of the Provisions of Title IX is the document that contains the institutional rules to channel any complaint filed based on this type of claim. This document is available on the website of the Inter-American University of Puerto Rico (www.inter.edu).

VIII. EDUCATIONAL RESOURCES

Text Books

Weiss, M. (2011). *Data Structures and Algorithm Analysis in Java,* 3 edition Prentice Hall

T. Cormen, C. Leiserson, R. Rivest, C. Stein, *Introduction to Algorithms,* 3nd Edition. The MIT Press, 2009. ISBN-10: 0262033844, ISBN-13: 978-0262033848.

Electronic Resources

NPTEL, "*E-Learning Courses from the ITTs & ITTc*," http://www.nptel.iitm.ac.in/video.php?subjectId=106102064

IX. BIBLIOGRAPHY

Books

1. R. Lafore, *Data Structures and Algorithms in Java*, 2nd Edition. Sams, 2002. ISBN-10: 0672324539, ISBN-13: 978-0672324536.
2. D.S. Malik, *C++ Programming: Program Design Including Data Structures*, 5th Edition. Course Technology, 2010. ISBN-10: 0538798092 ISBN-13: 978-0538798099
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, *Introduction to Algorithms*, 3rd Edition. The MIT Press, 2009. ISBN-10: 0262033844, ISBN-13: 978-0262033848.
4. A. Stepanov and P. McJones, *Elements of Programming*. Addison-Wesley Professional, 2009. ISBN-10: 032163537X, ISBN-13: 978-0321635372.
5. S. S. Skiena, *The Algorithm Design Manual*, 2nd Edition. Springer, 2008. ISBN-10: 1848000693, ISBN-13: 978-1848000698.
6. J. Edmonds, *How to Think About Algorithms*, Illustrated Edition. Cambridge University Press, 2008. ISBN-10: 0521614104, ISBN-13: 978-0521614108.

7. A. Drozdek, *Data Structures and Algorithms in Java*, 3rd Edition. Cengage Learning Asia, 2008. ISBN-10: 9814239232, ISBN-13: 978-9814239233.
8. K. Mehlhorn and P. Sanders, *Algorithms and Data Structures: The Basic Toolbox*. Springer, 2008. ISBN-10: 3540779779, ISBN-13: 978-3540779773.
9. P. Brass, *Advanced Data Structures*, Cambridge University Press, 2008. ISBN-10: 0521880378, ISBN-13: 978-0521880374.
10. R. Sedgewick, *Bundle of Algorithms in Java, Parts 1-5: Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms*, 3rd Edition. Addison-Wesley Professional, 2003. ISBN-10: 0201775786, ISBN-13: 978-0201775785.
11. Paul Deitel, Harvey Deitel, *C++ How to Program*, 7th Edition. Prentice Hall, 2009. ISBN-10: 0136117260, ISBN-13: 978-0136117261
12. Tony Gaddis, *Starting Out with C++: From Control Structures through Objects*, 6th Edition. Addison Wesley, 2008. ISBN-10: 0321545885, ISBN-13: 978-0321545886
13. Lewis, J. et all. (2011), *Java Foundations: Introduction to Program Design & Data Structures*, Second Edition, Addison Wesley

B. Electronics Resources

1. "Data Structure," in *Wikipedia, the free encyclopedia*
http://en.wikipedia.org/wiki/Data_structure
2. "Dictionary of Algorithms and Data Structures," *at NIST*
http://www.itl.nist.gov/div897/sqg/dads/
3. "Animated Algorithms: Sorting," in CS at DePauw University
http://www.csc.depauw.edu/~bhoward/courses/0203Fall/csc222/sort/
4. Sorting Algorithm Animation
http://www.sorting-algorithms.com/
5. "Sorting Algorithms Demo", in CS, at University of British Columbia
http://www.cs.ubc.ca/~harrison/Java/
6. "Animated Algorithms," *Data Structures and Algorithms, at University of Auckland*
http://www.cs.auckland.ac.nz/software/AlgAnim/alg_anim.html
7. CPlusPlus.Com, the C++ Resources Network
http://www.cplusplus.com/