**ABET Course Syllabus – CS2013**

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| **Code** | CS2013 | **Credits** | 3 |
| **Title** | Programming with Data Structures | **Coordinator** | Yuqing Zhu |

**Course Information**

1. **Catalog Description:** Advanced programming techniques; data structures such as linked lists, stacks, queues, trees, hash tables, skip lists, and graphs; sorting and searching algorithms; basic algorithm analysis; Laboratory activities and software development. Graded ABC/NC.
2. **Prerequisites:** CS 2012, recommended: MATH 2120.
3. **Contact Hours:** Lecture 2 hours, Laboratory 3 hours /week
4. **Required/Elective:** This course is required in the BS program.

**Textbook**

Data Structures and Algorithms in Java, 5th edition  Michael T. Goodrich

Introduction to JAVA Programming, by: Daniel Liang, 8th Edition

JAVA How to program, by Deitel and Deitel, 8th Edition

**Course Goals**

The Student Learning Outcomes that are addressed by the course are:

*SLO #2. Students will be able to demonstrate fluency in at least one programming language and acquaintance with at least three more.*

*SLO #3. Students will have a strong foundation in the design, analysis, and application of many types of algorithms.*

*SLO #5. Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.*

*SLO #6. Students will have the training to design, implement, and evaluate large software systems working both individually and collaboratively.*

Other outcomes of instruction: At the end of the course students are able to:

* Understand the concept of Abstract Data Type (ADT).
* Understand the design and implementation of common data structures, and search and sorting algorithms.
* Demonstrate the ability to use data structures and algorithms to solve complex programming problems in an efficient manner.
* Perform basic time and space complexity analysis of data structures and algorithms.

**Topics covered**

* Review of the primary programming language to be used in the class
* Algorithm analysis basics
* Recursion
* Generics
* Abstract Data Type
* Lists, stacks, and queues
* Trees and traversal
* Priority Queue
* Maps, hash tables, and skip lists
* Binary search trees
  + - Insert/delete element in a binary search tree
    - Pre-order, in-order and post-order traversal in binary search tree
* Sorting algorithms
  + - Insertion sort
    - Bubble sort
    - Merge sort
    - Quick sort
    - Heap sort
* Basic graph representation and algorithms
* Multithreading and parallel programming