Course Syllabus

CS – 205L Data Structure and Algorithms Lab

Credits: 1 Contact hours: 3

Instructor or Course Coordinator: Jiacun Wang

Textbook(s):

M. Goodrich, R. Tamassia and M. Goldwasser, *Data Structures and Algorithms in Java (6th edition)*, Wiley, 2014.

**Course description:**

Introduction to the design, implementation, and use of elementary data types (list, stack, queue, binary tree); algorithms for sorting and searching; and informal complexity analysis. All work will be done in a ‘hands on’ computer lab setting.

**Prerequisite(s):**

MA-130, CS-176 and CS-176L, all passed with a grade of C or higher. Corequisite: CS-205.

Specific outcomes of instruction:

When students complete this course they should be able to:

* Identify a class of solutions (algorithms) given a problem
* Create data structures on their own (not using libraries)
* Design algorithms to correctly solve problems which need these data structures for their solutions
* Analyze the complexity of algorithms and how using various data structures will change the complexity of the algorithms
* Use Java Collections in the context of this course

Relationship of course to student outcomes listed in criterion 3:

This course gives students an opportunity to develop:

* Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (Learning Outcome 2)

Topics covered:

* Arrays and searching
* Binary search and recursion
* Sorting and recursion
* Linked lists
* Stacks, queues, and dequeues
* Heaps and priority queues
* Object-oriented programming and Java container classes
* Advanced sorting (Quicksort, Mergesort, Shellsort)
* Linear-time sorting (Counting Sort, Radix Sort)
* Recursion and trees
* Sorted containers: sets and multisets
* Hash tables
* Binary trees
* HashMap versus TreeMap
* Trees and tree traversal

Course Syllabus

SE 306 – Formal Methods in Software Engineering

Credits: 3 Contact hours: 3

Course instructor or coordinator : Jiacun Wang

Textbook(s) :

Jiacun Wang and William Tepfenhart, Formal Methods in Computer Science, CRC Press, 2019.

Course Description :

Covers a variety of formal methods and applies them to software-specification development. Assumes a firm grounding in mathematical logic, knowledge of proof techniques, and skill in the translation of problems expressed in English into predicate logic.

**Prerequisites:** MA 120 or MA 130.

**Required or Selected elective:** Required

Specific outcomes of instruction:

After completing this course students will:

* Be able to describe the meaning of formal methods and the context in which they are useful
* Be able to verify that software meets the formally specified requirements
* Understand how mathematics can be applied directly to the development of software

Relationship of course to student outcomes listed in criterion 3:

This course assists students in achieving the following program outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics covered:

* Introduction to formal methods
* Sets and functions
* Finite state machines
* Propositional logic
* Temporal logic
* Model verification
* NuSMV
* Petri nets
* Timed Petri nets

SE 357/517 –Engineering Web Based Systems

**Credits:** 3 **Contact hours**: 3

**Instructor or Course Coordinator**: Jiacun Wang

**Suggested Reading Material**:

Latty Ullman, PHP and MySQL for dynamic web sites, 4th edition, Peachpit Press, ISBN: 978 0 321 78407 0

**Course description**:

A practical introduction to the principles, methods and tools required to create high-quality software applications for the distributed, client-server context of the Web. Emphasis is on architectural designs, and language and data access methods that are common in web-based systems. Notice that we will be writing programs to build our web applications rather than using any software package that is already on the market.

**Prerequisites:** SE205, SE207.

**Required or Selected elective:** Required

**Student Outcomes**

* Students will be able to design a solution to a web application.
* Students will be able to design an effective and efficient database for a data-driven web application.
* Students will be able to programming a web system using HTML, CSS, PHP, MySQL, Java Script, etc.
* Students will be able to address some fundamental security issues of web applications, such as access control, session control, and critical data encryption, etc.

Relationship of course to student outcomes listed in criterion 3:

This course assists students in achieving the following program outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
5. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Topics covered**

* HTML
* CSS
* PHP variables, strings, control structures, arrays
* PHP form processing, regular expression matching
* MySQL database
* Using PHP with MySQL, data storing and retrieving
* Common Web programming techniques
* Web engineering and application development
* Cookies and sessions
* Web security
* Java script
* Node.js