

Spring 2013

CS 3100-01/5100-01: Data Structures and Algorithms

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Course Syllabus

I. College/School **College of Engineering and Computer Science**
Department **Department of Computer Science and Engineering**

II. Course Information **ERIC BUCK**

Course Title: **Data Structures and Algorithms**

Course Abbreviation and Number: **CS 3100-01**

Course Cross Listing(s) Abbreviation and Number: **CS 5100-01**

Check ("x") all applicable:

General Education Course _____ Writing Intensive Course _____ Service Learning Course _____

Laboratory Course _____ Ohio TAG (Transfer Assurance Guide) Course _____

Ohio Transfer Module Course _____ Others (specify) _____

III. Course Registration

Prerequisites: **(C or higher in CS 1181) and (C or higher in CEG 3310)
and CEG 2350 and (MTH 2570 or CS 2200)**

Corequisites: **None**

Restrictions: **None**

IV. Student Learning Outcomes

- **Analyze basic algorithms for space and time complexity**
- **Design abstract data types appropriate for a given problem**
- **Implement data structures in an efficient manner**
- **Design and implement non-graphical user interfaces**
- **Select and implement appropriate data structures for a given problem**
- **Design algorithms to solve specific problems**

V. Suggested Course Materials (required and recommended)

Example Required Text:

Data Structures and Algorithm Analysis in C++, Third Edition (Dover Books on Computer Science) [Paperback] by Dr. Clifford A. Shaffer Paperback: 624 pages Publisher: Dover Publications; 3 edition (September 14, 2011) Language: English ISBN-10: 048648582X ISBN-13: 978-0486485829

VI. Suggested Method of Instruction

Lecture

VII. Suggested Evaluation and Policy

Midterm A (15%)

Midterm B (15%)

Final Exam (20%)

Five Projects (10% each)

All Assignments must be submitted via Pilot drop

VIII. Suggested Grading Policy

A: 100-90, B: 89-80, C: 79-70, D: 69-60, F: less than 60.

IX. Suggested Assignments and Course Outline

| Week | Topics/Activity | Text Reading |
|-------------|---|---------------------|
| 1 | Abstract Data Types, Implementation in C++ | Chs. 1, 2 |
| 2 | Algorithm Analysis for iterative algorithms | Ch. 3 |
| 3 | Review of lists, stacks, queues | Ch. 4 |
| 4 | Binary Trees | Ch. 5 |
| 5 | General Trees | Ch. 6 |
| 6 | Searching: Self-organizing structures, Hashing | Ch. 9 |
| 7 | Tries and Height Balanced Trees | Ch. 13.1 – 13.2 |
| 8 | Graphs: Definitions, Implementation, Traversal | Ch. 11.1 – 11.3 |
| 9 | Graphs: Shortest Paths, Spanning Trees | Ch. 11.4 – 11.8 |
| 10 | Sorting: Internal and External | Ch. 7, 8 |
| 11 | Indexing: Linear and Tree Indexing, B-Trees | Ch. 10 |
| 12 | Algorithms: greedy, exhaustive, dynamic programming, branch & bound | Ch. 14 & 15 |
| 13 | Algorithms: decision problems, decidability, P and NP | Ch. 15 |
| 14 | Hardware and data structures: garbage collection, cache, virtual memory, and efficiency | Web resources |

X. Other Information

Programming assignments will include additional, more complex objectives for students enrolled in CEG 5100. Additionally, the midterm and final exams will each have one or more additional questions for students enrolled in CEG 5100. These questions should cover material of a more theoretical and technical nature than the undergraduate questions.