CS331 DATA STRUCTURES AND ALGORITHMS – SPRING 2018
Lecture 11:25am-12:40pm Mon/Wed - 152 Pritzker Science Center Lab 11:25am-12:15pm Fri - Stuart 108/112F
Instructor: Matthew Bauer bauerm@iit.edu Office Hours: Tuesday 8:30-11am, alternating Thursday 8:30-11am 206D Stuart, or via email

TAs (office hours in 108SB): You can see any TA for assistance during their office hours in 108 Stuart, but your work will be graded by your assigned Grading TA.
Joyson, Jithin jjoyson@hawk.iit.edu W 11:30-12:30, F 10-11am Yang, Yichen yyang153@hawk.iit.edu F 12:15-2:15pm Ai, Zhihao zai@hawk.iit.edu Tue 2:50-4:50pm Lalani, Tanwir M. tlalani@hawk.iit.edu Tue 11:30-12:30, Wed 1-2pm

Textbooks (online only): Problem Solving With Algorithms and Data Structures Using Python
http://interactivepython.org/runestone/static/pythonds/index.html

Computing Resources: All assignments will be distributed and submitted via the Class notebook server / Python dev environment https://braeburn.cs.iit.edu/jupyter/hub/ Jupyter Notebook Install Guide http://jupyter.org/install.html Watch this screencast https://youtu.be/ueNpiWRgoa8 for instructions. Log in using @hawk.iit.edu

Catalog Description: Implementation and application of the essential data structures used in computer science. Analysis of basic sorting and searching algorithms and their relationship to these data structures. Particular emphasis is given to the use of object-oriented design and data abstraction in the creation and application of data structures.

Course Objectives: Students should be able to:
- Explain, implement, and apply the following data-structures: lists (unordered and ordered), stacks, queues, expression trees, binary search trees, AVL-trees, hash tables, and heaps.
- Analyze the time and space complexity of algorithms using asymptotic upper bounds (big-O notation).
- Explain and use references and linked structures.
- Outline basic object-oriented design concepts: composition, inheritance, polymorphism.
- Outline basic concepts of immutable data structures and explain the trade-offs compared to mutable data.
- Write and test recursive procedures, and explain the run-time stack concept.
- Analyze searching and sorting algorithms, and explain their relationship to data-structures.
- Choose and implement appropriate data-structures to solve an application problem.
- Understand techniques of software development, such as unit testing and version control.

Lecture: Review reading before arriving to class. Download starter notebooks before class. Class will consist of lots of interactive demos. Completed notebooks are always posted

Assignments: Labs(11)-25% Lecture Participation-5% Exam1-20% Exam2-20% Exam3-30%
A=90-100 B=80-89 C=70-79 D=60-69 E=0-59 NO LATE LABS ACCEPTED! NO EXTRA CREDIT!
Failure to attend class and participate in class discussions may result in a lowering your final grade by one letter grade. Also, the instructor reserves the right to fail any student that receives a failing score on any exam regardless of the scores on the other assignments. All grades will be posted in Blackboard

Ethics: Any behavior on any homework, lab, project or exam that could be considered copying or cheating will result in an immediate zero on the assignment for all parties involved and will be reported to academichonesty@iit.edu See the IIT Code of Academic Honesty, https://web.iit.edu/student-affairs/handbook/fine-print/code-academic-honesty

Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources (CDR) located at 3424 S. State Street - 1C3-2, 312 567.5744 or disabilities@iit.edu

Communication is critical to the success and satisfaction of the learning experience. Please take advantage of myself, my posted office hours, and e-mail to communicate any class issues with me.
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<th>Week</th>
<th>Monday</th>
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| Week 1  | 1/8  Reading: *PythonDS: Introduction*  
Reading: *Python tutorial*, ch 1-5, 9  
Syllabus/Overview, Language Intro | Language Intro                    | Lab 1 Preliminaries – Due Sunday 1/21     |
| Week 2  | 1/15 NO CLASS                                                          | Language Intro                    | Lab 1 Preliminaries – Due Sunday 1/21     |
| Week 3  | 1/22 Language Intro                                                   | Language Intro                    | Lab 2 Iocane – Due Sunday 2/4             |
| Week 4  | 1/29 Reading: *PythonDS: Analysis*  
Searching, Sorting, and Timing | Searching, Sorting, and Timing    | Lab 2 Iocane – Due Sunday 2/4             |
|         |                                                                        |                                   |                                             |
| Week 5  | 2/5 Array-backed lists                                                | Array-backed lists                | Lab 3 Ngrams – Due Sunday 2/11             |
| Week 6  | 2/12 Reading: *PythonDS: 3.19-3.21*  
Linked structures, Linked lists | Linked lists                       | Lab 4 Arraylist – Due Sunday 2/18         |
|         |                                                                        |                                   |                                             |
| Week 7  | 2/19 EXAM 1 (covers labs 1-4)                                         | Reading: *PythonDS 5.5*  
Hashing and Hashtables | Lab 5 LinkedList – Due Sunday 3/4 |
| Week 8  | 2/26 Hashing and Hashtables                                           | Reading: *PythonDS 3.3-3.12*  
Stacks and Queues | Lab 5 LinkedList – Due Sunday 3/4         |
| Week 9  | 3/5 Stacks and Queues                                                 | Reading: *PythonDS 6.8-6.10*  
Priority Queues (and Heaps) | Lab 6 Hashtable – Due Sunday 3/18         |
| Week 10 | 3/19 Priority Queues (and Heaps)                                      | Reading: *PythonDS Chapter 4*  
On Recursion                               | Lab 7 StackApps – Due Sunday 3/25         |
|         |                                                                        |                                   | Lab 8 CircQueue – Due Sunday 3/25          |
|         |                                                                        |                                   | Lab 11 BSTrees – Due Sunday 4/29           |
|         |                                                                        |                                   | Lab 11 BSTrees – Due Sunday 4/29           |
| Week 11 | 3/26 On Recursion                                                     | On Recursion                      | Lab 9 Heaps – Due Sunday 4/1               |
| Week 12 | 4/2 EXAM 2 (covers labs 1-9)                                           | Binary Search Trees               | Lab 10 Recursion – Due Sunday 4/15         |
| Week 13 | 4/9 Reading: *PythonDS 6.11- 6.14*  
BSTree data structure | BSTree data structure              | Lab 10 Recursion – Due Sunday 4/15         |
| Week 14 | 4/16 Reading: *PythonDS 6.15-6.18*  
Balanced BSTree: AVL Tree | Balanced BSTree: AVL Tree         | Lab 11 BSTrees – Due Sunday 4/29           |
| Week 15 | 4/23 Balanced BSTree: AVL Tree                                        | Final Exam Review                 | Lab 11 BSTrees – Due Sunday 4/29           |
| Final’s Week | EXAM 3 (covers labs 1-11)                |                                   |                                             |