Data Structures  
Syllabus

CATALOG DESCRIPTION:
(4 credits) Abstract data types and their implementations using various data structures and algorithms; elementary algorithm analysis; space/time trade-offs; sorting and searching; finite graph algorithms; introduction to object oriented design and programming; software engineering principles.  
Prerequisites: C201 Computer Programming II; C151 Multiuser Operating Systems.

General Description:
The course assumes thorough mastery of the parts of the Java programming language through select Collections and inheritance. Students will be introduced to the standard abstract data types of professional computing. Students will use the UNIX operating system and the Emacs (or similar) editor. Programming assignments allow students to implement the studied data structures and to gain additional practice to improve their programming skills.

TEXTBOOK:  
ISBN: 9781118771334

REFERENCE:  
Books on Unix/Linux, Emacs, and Java programming. Also, additional books on Data Structures may be helpful.

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Course Webpage: http://pages.iu.edu/~dsurma

OFFICE HOURS:  
Wednesdays 1:00pm - 3:00pm and Thursdays 12:30pm - 2:30pm held virtually. Others by appointment either virtually or in-person. Questions via E-mail are strongly encouraged.

ORGANIZATION:  
The course will meet via Zoom on Monday and Wednesday mornings from 10:00am-11:50am. A 10 minute break will usually occur near 11:00am. Some sessions will be held asynchronously.

TECHNOLOGY:  
A computer equipped with a camera and microphone is **required** for this course. Zoom will be used extensively which may require a small download. Be sure to check iuanywhere/iuware.iu.edu for software that may be helpful.
Homework Assignments:

Homework problems will be regularly assigned with the intent to provide exercises that check your mastery of the textbook and lecture material. *Usually* these problems are of the “pencil and paper” variety although sometimes they may require a short program. These assignments are due at the beginning of the class period on the due date. They will be accepted with a 50% late penalty at the beginning of the next class meeting period but will not be accepted after that time. Assignments are due even if you are unable to attend that day.

Programming Assignments:

Programming assignments will be regularly assigned (usually weekly or bi-weekly) with details and due dates provided on the program description handout. The actual source code along with other supporting items will be turned in via Canvas by the due date and time. The following late penalty will be strictly enforced.

*The assignment will be accepted late up to the start of the next meeting period with a 50% penalty. After that time, the assignment will NOT be accepted and the score will be zero.*

The programs MUST be properly commented and formatted. Details of acceptable style and formatting will be discussed in class. Assignments submitted without proper formatting MAY be returned with a score of ZERO. Also, submitted programs must compile for any credit to be granted.

One of the attempted programming assignments will be dropped subject to stipulations given in class. Note: If one fails to submit anything for an assignment the score will be zero and it cannot be dropped.

Programming Environment:

Submitted programs must successfully compile and execute on the Department of Computer Science lab computers. You may develop your programs using an editor (e.g. Emacs) and compile and run the code natively on these computers. SSH access is available. Alternatively, you may use an Integrated Development Environment of your choice (e.g. NetBeans) but you must ensure that your code successfully compiles and runs on the lab computers.

Java Version: JDK 1.8.0_262 installed in CS labs.
Java SE14 released March 2020
Emacs Version: 24.3.1 installed in CS labs.
Emacs 27.1 released August 2020.
Attendance & Participation:
Since you, or someone on your behalf, are/is paying for this course it is expected that you actively participate in it. Among other items, this means that you should attend lectures regularly and that you should take an interest in the class and maintain a good attitude toward learning the course material. Along with participation you are required to treat the Instructor and your fellow students with respect. To encourage you to attend, participate and to conduct yourself professionally in the class, 5% of your final grade is assigned to this category. You may miss 4 lectures without penalty. An absence beyond this amount results in forfeiture of this 5%. Additional details of what is expected will be provided by the Instructor at the first class meeting. The following is a note from the IUSB student handbook:

“Your conduct must conform to the Indiana University Code of Student Rights, Responsibilities and Conduct. Section III of the Code defines academic and personal misconduct (http://www.iu.edu/~code/code/index.shtml).”

Quizzes:
Quizzes will be given regularly (typically weekly or bi-weekly) to check student progress in learning the important concepts. These will be short (15-20 minutes) and will be announced at least one week in advance. No make-ups will be given. However, one quiz score will be dropped. Online proctoring will be done.

Examinations:
Two examinations will be given during the course of the semester covering topics from the textbook, posted resources as well as information given during lectures. Online proctoring will be done.

Policy on Incompletes:
The granting of an Incomplete in this course is highly discouraged. Thus, it will only be done in very rare cases and will conform fully with CLAS policies. Keep up with the course and notify the instructor promptly of any problems. You will receive more help if you act early.

Grading:
The following weights will be used to determine the final grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework &amp; Programming Assignments:</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes:</td>
<td>15%</td>
</tr>
<tr>
<td>Attendance &amp; Participation:</td>
<td>5%</td>
</tr>
<tr>
<td>Exams:</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam (Comprehensive):</td>
<td>20%</td>
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</table>
Discrepancies:
If you have any questions regarding how any assignment or test/quiz is graded and you think that you deserve more points than you received, you must see the Instructor within one week of the time the assignment is first returned to the class. No claims, justifiable or not, will be considered after this deadline. Be advised that any assignment brought to the Instructor is subject to a total regrading.

Final Note on Grades:
It is the opinion of the Instructor that a grade is to be earned - not bargained for or pleaded for at the end of the term. Therefore, keep up with the work during the entire semester and do not try to save your grade during the final week(s) of the semester.

Important Dates:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Labor Day (class meets)</td>
<td>September 7</td>
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<tr>
<td>Last Day to Withdraw with automatic W:</td>
<td>Sunday, October 25, 11:59pm</td>
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<td>Thanksgiving Break Week:</td>
<td>November 23-29</td>
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<tr>
<td>Last Day of Class</td>
<td>December 9</td>
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<tr>
<td>Final Exam</td>
<td>Wednesday, December 16th - 10:00am</td>
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Tentative Dates for Exams: September 30 and November 11
Exam dates will be confirmed one week in advance. Quiz dates available on the course website.

Final Examination:
The final exam is comprehensive and will be given at the scheduled time. If you have any special circumstances that might conflict with this time you MUST discuss it with the Instructor prior to November 18th. No changes from this time will be allowed for any reason after this date.

Title IX information:
What you should know about sexual misconduct: IU does not tolerate acts of sexual misconduct, including sexual harassment and all forms of sexual violence. If you have experienced sexual misconduct, or know someone who has, the University can help. It is important to know that federal regulations and University policy require faculty to promptly report complaints of potential sexual misconduct known to them to the Deputy Title IX Coordinator(s) on campus to ensure that appropriate measures are taken and resources are made available. The University will work with you to protect your privacy by sharing information with only those that need to know to ensure the University can respond and assist. If you are seeking help and would like to speak to someone confidentially, you can make an appointment with a Mental Health Counselor on campus (contact information available at http://stopsexualviolence.iu.edu/employee/confidential.html). Find more information about sexual violence, including campus and community resources at http://stopsexualviolence.iu.edu/.
**Disabilities Note:**
If you need adaptations or accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible. My office hours are given on this syllabus, are posted on the course WWW page and are also located outside of my door. Students also may call Disabled Student Services (520-4832) for additional information about services available at IUSB.

**COURSE WEBPAGE & CANVAS:**

This class will make use of both a website and the Canvas course management system. In the first meeting period students will be shown how to access these resources and a discussion will be held on how they will be used. The website location is [http://pages.iu.edu/~dsurma](http://pages.iu.edu/~dsurma)

**CLASS ATMOSPHERE:**

Class meeting time, while held virtually, is a precious commodity. Therefore, please be on time and conduct yourself professionally. This course contains students with different backgrounds and experiences. The goal is to provide everyone with an opportunity to learn as much as they desire. Always feel free to ask questions and to take part in class discussions.

**Use of cell phones, notebook computers, and other electronic devices:**

During lectures students should refrain from using their personal electronic devices (phones, laptops, tablets, etc.) in order to focus on the session. For quizzes and examinations, no electronic device, with the exception of the computer being used for the quiz/test, is permitted. Prior to the first quiz the instructor will discuss the procedure for proctored online assessments.

**KEYS TO SUCCESS:**

This class is designed so that everyone *should* be able to get out of it whatever they desire. To obtain a high final grade, the following are some time-tested techniques which should help.

* Come to class and be on time. Believe it or not, even if you are not at your best, just being in class always helps.

* Keep up with the work. Do not fall behind and think that you will be able to catch up later in the course. Late penalties are severe and assignments often build on one another.
Notify the Instructor immediately if something happens which causes you to miss class. Informing the Instructor a week or more after the fact will not be received well and penalties accrue until the Instructor is notified. The Instructor can be contacted via telephone (his or through the admin. assistant), e-mail, or fax. Not being able to reach the Instructor will not be accepted as an excuse.

Remember that if you miss class, it is YOUR responsibility to find out what you missed and to get caught up with the work. Check Email, the Canvas site and the course website on a daily basis.

If you find that you will not be able to complete the course, do yourself a favor and formally withdraw. The process is simple and a ‘W’ on your transcript is far better than an “F” or “FN”.

Have a good attitude. This class should be enjoyable as well as being informative. The Instructor strives to make the class environment one where learning can occur in a relaxed atmosphere.

Be respectful of your fellow students and the Instructor.

Partial List of Topics: - (not necessarily covered in this order)

Pointers, Dynamic Allocation, Arrays, Linked Lists
The Stack and Queue ADTs (Abstract Data Types)
Measuring Algorithm Performance
The Table ADT
Binary Trees
Binary Search Trees, 2-3-4 Trees, Red-Black Trees
Recursion
Hash Tables
The Priority Queue ADT
Searching and Sorting Algorithms
The Java Collections framework
Tail Recursion, Finite Graphs, AVL Trees
Java Generics
Breadth-first and Depth-first search algorithms
Dijkstra’s Shortest Path Algorithm
Minimum Spanning Tree and the Union/Find Problem