Course Code: CSE 2321
Course Title: Foundations I–Discrete Structures
Credit Hours: 3.0
Course Website: http://u.osu.edu/alzalg.1/teaching

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Email: alzalg.1@osu.edu and baha2math@gmail.com
Phone: (614) 247-7331 (Email Preferred)
Office Hours: MonWed 12:40P-1:40P, Tue 1:00P-3:00P

Course and Graders Information:

<table>
<thead>
<tr>
<th>Course Information</th>
<th>Graders Information</th>
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<tbody>
<tr>
<td>Section</td>
<td>Days</td>
</tr>
<tr>
<td>10621</td>
<td>MWF</td>
</tr>
<tr>
<td>10620</td>
<td>MWF</td>
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Course Description: Propositional logic, Boolean algebra, first-order logic, sets, functions, graphs and trees, analysis of algorithms, asymptotic analysis, combinatorics, graph algorithms.

Prerequisite(s) and Co-requisite(s):
(1) CSE 2122, CSE 2123, or CSE 2221.
(2) Math 1151, or Math 1161.
Co-requisite for those entering with CSE 2221: CSE 2231.

Textbook: Introduction to Algorithms, 3rd Edition, by Cormen, Leiserson, Rivest, and Stein (CLRS). This textbook will be used for both the Foundations I and Foundations II courses. If you make a career in computer science, you (and your employers) are likely to benefit from your keeping it as a reference. There is an eBook available in the OSU library by accessing. It is a single-use access which means that only one student can use it at a time. See https://library.ohio-state.edu/record=b6916144~S7

Readings:
- From the MIT open courseware: “Logic.” This is posted on the course website.
- From the CLRS textbook: Appendices A, B, C.1, and D.1; Chapters 1, 2, 3, 4, and 22.
- Additional resources may be added during the semester.
Reference(s): *Discrete Mathematics and Its Applications*, by Kenneth Rosen. 
This book should be available in the library; any of their numerous editions would be equally helpful. It is loaded with interesting exercises, some of which are worked out.

Course Objectives: 
At the completion of this course, students should be able to:

1. Be competent with using propositional logic.
2. Be familiar with first-order predicate logic.
3. Be familiar with proving by contradiction, by ordinary induction and by strong induction.
4. Be familiar with using asymptotic notation.
5. Be familiar with analyzing running time of simple iterative algorithms.
6. Be familiar with using graph theory.
7. Be exposed to analyzing running time of recursive algorithms.
8. Be exposed to sorting and searching.
9. Be exposed to designing graph algorithms.

Course Topics: 
- Mathematical reasoning.
- Analysis of simple algorithms.
- Sorting and searching.
- Graph theory.
- Graph algorithms.

Grade Distribution:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>24%</td>
</tr>
<tr>
<td>First Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Second Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Attendance, Participation, etc.</td>
<td>06%</td>
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Important (Tentative) Dates:¹

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>Tu.</td>
<td>Aug. 20</td>
<td>First Day of Class</td>
</tr>
<tr>
<td>Mo.</td>
<td>Sept. 2</td>
<td>Labor Day (no class)</td>
</tr>
<tr>
<td>Mo.</td>
<td>Sept. 30</td>
<td>First Exam</td>
</tr>
<tr>
<td>Fr.</td>
<td>Oct. 11</td>
<td>Autumn Break (no class)</td>
</tr>
<tr>
<td>Mo.</td>
<td>Nov. 4</td>
<td>Second Exam</td>
</tr>
<tr>
<td>Mo.</td>
<td>Nov. 11</td>
<td>Veterans Day (no class)</td>
</tr>
<tr>
<td>We.</td>
<td>Nov. 27</td>
<td>Thanksgiving Break (no class)</td>
</tr>
<tr>
<td>Fr.</td>
<td>Nov. 29</td>
<td>Columbus Day (no class)</td>
</tr>
<tr>
<td>We.</td>
<td>Dec. 4</td>
<td>Last Day of Classes</td>
</tr>
<tr>
<td>Fr.-Th.</td>
<td>Dec. 6-12*</td>
<td>Final Exams</td>
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¹Below is a link to the Registrars Academic Calendar which includes drop dates, etc: 
[https://registrar.osu.edu/staff/bigcal.asp](https://registrar.osu.edu/staff/bigcal.asp)

★Final exams is determined by the OSU Registrar. Below is the link to final exam schedule: 
[https://registrar.osu.edu/scheduling/SchedulingContent/AUI9Finals.pdf](https://registrar.osu.edu/scheduling/SchedulingContent/AUI9Finals.pdf)
Course Policies:

- **Attendance and Electronic Devices**
  - It is important that you attend class regularly. Attendance is expected and will be taken each class.
  - Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee’s responsibility to get all missing notes or materials.
  - Electronic devices must be put away during class unless they are being used specifically for that day’s lecture.

- **Communication**
  - Information regarding the course will be posted on the course website. CSE 2321 is not an online course. **Students are responsible for any announcements/information provided on the course website.**

- **Assignments**
  - There will be **15 homework assignments.**
  - Homework assignments and solutions will be posted regularly on the course website.
  - Each assignment weights 2% of your final mark. All assignments weight 24% of your total grade. So, 12 scores out of 15 will be counted toward your grade. For each student, we will drop the lowest scores of 3 assignments at the end and use the remaining 12 assignments to calculate the grade.
  - Homework assignments are due at the start of class on **each Monday except** for Sept. 30 and Nov. 4, which are exam days, and for Sept. 2 and Nov. 11, which are holidays. In these “no class” days, homework assignments are due at the start of class on the following Wednesdays. We also add another exception for the last homework assignment, which will be due Wednesday, Dec. 4, instead of Monday, Dec. 2.
  - After class starts the assignment is considered late. The homework assignment can then be handed in any time until the start of the next class for a 50% penalty of the point value of the assignment. No assignments will be accepted after that time. **Late homework assignments will be returned with the following homework assignment.**
  - Students may work with a partner on the homework assignments but each student must write up the assignment individually. Please write the name of the partners on both homework assignments, the name of the student who wrote the paper should appear first. Please write your name, assignment name, and section at the top of your papers and make sure the papers are stapled.

- **Exams**
  - Exams are closed notes, closed book.
  - The final exam is comprehensive. The date/time of the final exam is determined by the OSU Registrar. Final exams may not be taken early.
  - Makeup exams require that appropriate documentation be provided ahead of time and are up to the discretion of the instructor.
• Grading Scheme
  – The OSU grading scheme is used to determine final grades.
  – If there are unforeseen emergencies that impact the grading scheme, appropriate adjustments will be made. An example of an unforeseen emergency would be a fire alarm going off during the final exam.

Academic Misconduct:

Students are required to follow the Ohio State Code of Student Conduct which can be found at http://studentaffairs.osu.edu/pdfs/csc_12-31-07.pdf. Among the other restrictions, pay specific attention to the section on Academic Misconduct. Among the restrictions, students are prohibited from:

• Providing or receiving information during exams
• Providing or receiving assistance on homework other than as outlined elsewhere on this syllabus
• Submitting plagiarized (i.e. copied but unacknowledged) work for credit

Note: Faculty is required by the University to report any suspected violation of these conditions to the Council on Academic Misconduct. Misconduct cases are resolved via the CoAM’s hearing processes. More about this process can be found at: http://oaa.osu.edu/coam.html

Tentative Schedule, and Topics Covered:

The weekly coverage might change as it depends on the progress of the class. However, you must keep up with the reading assignments.
<table>
<thead>
<tr>
<th>Week</th>
<th>Details</th>
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| Week 1     | - (Lec 1) Wed, Aug 21: General intro. Intro to propositional logic  
             - (Lec 2) Fri, Aug 23: Truth tables, logical operators (negation, and, or) |
| Week 2     | - (Lec 3) Mon, Aug 26: Implication [HW 1 Due]  
             - (Lec 4) Wed, Aug 28: Contrapositive, converse, inverse, biconditional  
             - (Lec 5) Fri, Aug 30: Tautologies, contrad, contingencies, negating cmpd stats |
| Week 3     | - Mon, Sep 2: Labor Day (no class)  
             - (Lec 6) Wed, Sep 4: Propositional logic modeling, important laws [HW 2 Due]  
             - (Lec 7) Fri, Sep 6: Disjunctive normal form |
| Week 4     | - (Lec 8) Mon, Sep 9: Conjunctive normal form [HW 3 Due]  
             - (Lec 9) Wed, Sep 11: Intro to predicate logic, quantifiers  
             - (Lec 10) Fri, Sep 13: Multiple quantifiers |
| Week 5     | - (Lec 11) Mon, Sep 16: Symbolizing statements [HW 4 Due]  
             - (Lec 12) Wed, Sep 18: Intro to set theory  
             - (Lec 13) Fri, Sep 20: Power set, manipulating sets, operations, specification |
| Week 6     | - (Lec 14) Mon, Sep 23: Mathematical induction, summations [HW 5 Due]  
             - (Lec 15) Wed, Sep 25: Intro to asymptotic analysis, algorithmic statements  
             - (Lec 16) Fri, Sep 27: Review for First Exam |
| Week 7     | - Mon, Sep 30: [First Exam] ⋆ ⋆ ⋆  
             - (Lec 17) Wed, Oct 2: Choosing an algorithm, intro to running time [HW 6 Due]  
             - (Lec 18) Fri, Oct 4: Analysis of an algorithm with types |
| Week 8     | - (Lec 19) Mon, Oct 7: Comparing algorithms [HW 7 Due]  
             - (Lec 20) Wed, Oct 9: More examples on running time, upper/lower bounds  
             - Fri, Oct 11: Autumn Break (no class) |
| Week 9     | - (Lec 21) Mon, Oct 14: Asymptotic notations [HW 8 Due]  
             - (Lec 22) Wed, Oct 16: Properties of asymptotic notations  
             - (Lec 23) Fri, Oct 18: More examples on asymptotic notations |
| Week 10    | - (Lec 24) Mon, Oct 21: Proofs using limits [HW 9 Due]  
             - (Lec 25) Wed, Oct 23: Describing the running time of a program  
             - (Lec 26) Fri, Oct 25: Linear search, selection sort, nonrecursive programs |
| Week 11    | - (Lec 27) Mon, Oct 28: Recursive programs, substitution method [HW 10 Due]  
             - (Lec 28) Wed, Oct 30: Iterative method, binary search, merge sort  
             - (Lec 29) Fri, Nov 1: Recursion-tree method. Review for Second Exam |
| Week 12    | - Mon, Nov 4: [Second Exam] ⋆ ⋆ ⋆  
             - (Lec 30) Wed, Nov 6: Intro to graph theory, graph terminology [HW 11 Due]  
             - (Lec 31) Fri, Nov 8: More graph terminology, graph properties |
| Week 13    | - Mon, Nov 11: Veterans Day (no class)  
             - (Lec 32) Wed, Nov 13: More properties, Eulerian path/cycle [HW 12 Due]  
             - (Lec 33) Fri, Nov 15: Hamiltonian path/cycle, graph coloring |
| Week 14    | - (Lec 34) Mon, Nov 18: Directed graphs [HW 13 Due]  
             - (Lec 35) Wed, Nov 20: Graph representation  
             - (Lec 36) Fri, Nov 22: Breadth-first search algorithm |
| Week 15    | - (Lec 37) Mon, Nov 25: Depth-first search algorithm [HW 14 Due]  
             - Wed, Nov 27: Thanksgiving Break (no class)  
             - Fri, Nov 29: Columbus Day (no class) |
| Week 16    | - (Lec 38) Mon, Dec 2: Topological sorting  
             - (Lec 39) Wed, Dec 4: Other topics. Review for Final Exam [HW 15 Due] |