COMP 163: Discrete Structures (Section 001)
Spring 2022 Course Information & Syllabus

Instructor: R. I. Greenberg

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Office Hours: In Doyle Center Room 216: Mon. and Wed. 12:45–1:45 pm. WHEN CLASS IS BEING HELD ON-CAMPUS
These are guaranteed times to find me except as announced in advance or at `http://bit.ly/RIGcal`. You should also feel free to look for me at other times or make appointments.

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Departmental tutoring schedule: See `http://www.luc.edu/cs/schedules/tutoringhours`.

Lectures: MW 2:45 – 4:00 pm in Cuneo 324.
Lecture notes and handouts are generally available on the web. The handouts are numbered sequentially, starting with handout 1.

Course Objectives: This course covers elements of discrete mathematics relevant to the design of computer hardware and software and especially to the design and analysis of algorithms. Topics to be covered include logic, sets, functions, relations, induction, modular arithmetic, elementary combinatorics, graphs and trees, elementary probability, boolean algebra, and finite-state machines. We will also cover asymptotic notation and recurrences and use these tools to analyze a few algorithms for fundamental computing tasks.

Prerequisites: MATH 117 or Placement.

Textbook: Richard Johnsonbaugh. *Discrete Mathematics.* Pearson Prentice Hall, 7th or 8th edition. Recommended.

Course Requirements: There will be several homework assignments, four tests, and a final. The weightings within the semester grade will be: Homework: 22%, Tests 1–4: 12% each, and Final exam: 30%.

Homework: Only homework turned in by the due date is guaranteed to be graded. Any special circumstances that cause difficulty in meeting the deadlines should be brought to the attention of the instructor in advance. Homework must be handed in by the start of class on any due date, since solutions may be discussed in the same class on occasion. Homework will generally be submitted through a specified online mechanism.

Exams: The schedule tentatively calls for four 50 minute tests in week 6, week 8, week 11, and week 13. The final exam is scheduled for 4:15–6:15pm Friday, May 6.

Collaboration: *No* collaboration is permitted on exams. *Collaboration* on homework is acceptable, but *copying* is not! (Safeguard your files and printouts.) You may discuss solution techniques with other students, but you must write up your solutions independently. If you obtain a solution through research, e.g., in the library or online, cite your source completely and write up the solution in your own words.

Tentative Course Outline and Approximate Schedule:

Recommended readings from the text are shown in parentheses. (When selected sections or subsections are listed, it is assumed that you will include the introduction of the corresponding chapter or section.)

1. (1/19) Administrivia. Logic introduction. Sections 1.2–3.
2. (1/24) More on Logic and Proofs. Sections 1.4–6 and 2.1–2. HW1 (Logic) out 1/24.
3. (1/31) Induction. Sections 2.4–5. Sets (1.1). HW2 (induction) out 1/31. HW1 due 2/2.
4. (2/7) Sequences & Strings (3.2). Functions, Modular arithmetic (3.1). HW2 due 2/9.
5. (2/14) Relations (3.3–4). Review for Exam I. HW3 (sets, functions, relations) out 2/14.
6. (2/21) Exam 1 (2/21) on Sections 1.1–6, 2.1–2, and 2.4. Elementary algorithms (4.1–2). Analysis of algorithms (4.3).
7. (2/28) Recursive algorithms, Fibonacci numbers. Section 4.4. Euclidean algorithm. Sections 5.1 and 5.3. (The beginning of Section 5.2 through Figure 5.2.2 is also good basic material to be familiar with; COMP 264 covers most of the material in Section 5.2 and more.) Review for Exam II. HW3 due 2/28. HW4 (algorithms) out 2/28.
8. (3/14) Exam 2 (3/14) on Sections 3.1–4. Counting principles, permutations and combinations. Sections 6.1–2. Generalized permutations. Section 6.3 before Example 6.3.4. HW4 due 3/16. HW5 (counting) out 3/16.
9. (3/21) Binomial coefficients, pigeonhole principle. Sections 6.7–8. Inclusion and exclusion (not directly in text). Discrete probability. Sections 6.5–6 prior to "Conditional Probability".
10. (3/28) Recurrence relations and solution methods. Sections 7.1–2. Review for Exam III. HW5 due 3/28. HW6 (probability, recurrences) out 3/28.
11. (4/4) Exam 3 (4/4) on Chapters 4–6 except probability. Using recurrences for analysis of algorithms. Section 7.3. Graphs. Sections 8.1–2 and 8.5.
12. (4/11) Trees. Sections 9.1–3. Combinatorial circuits (11.1–2). Review for Exam IV. HW6 due 4/11. HW7 (graphs, circuits) out 4/11.
13. (4/20) Exam 4 (4/20) on Sections 6.5–6 and Chapters 7–8. Boolean Algebras (11.3–4).
14. (4/25) Finite-state machines. Sections 12.1–2. HW7 due 4/25.