![Reedley College logo]

Fall 2020
CSCI-26
Mathematics for Computer Science
Syllabus

Instructor: Simon Sultana, Ph.D.
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Response time: < 24 hours
Section Number: 53086

Dates: 8/10/2020 – 12/8/2020
Location: Online, Asynchronous
Office Hours: Friday 1-3pm on Zoom at
https://cccconfer.zoom.us/j/99435158794?pwd=WThkRFZta3dvb3FvbXpEZ01QQTB6dz09

Unit(s): 4
Prerequisites: Programming Concepts and Methodology I (CSCI 40) or
Programming for Scientists and Engineers (ENGR 40)

Advisory: ENGL-125 – Writing Skills for College and ENGL-126 Reading Skills for College

Course Description: This course studies elements of discrete mathematics which have applications to computer science. Topics include sets, propositional and predicate logic, relations and functions, proof techniques, graphs, trees, and discrete probability.

Course Goals and Student Learning Outcomes:
Upon completion of this course, students will be able to:
- Apply fundamental proving techniques of discrete mathematics in computer science. These techniques include proofs by mathematical induction.
- Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
- Demonstrate different traversal methods for trees and graphs.
- Demonstrate knowledge of algorithms, recursive algorithms, and the analysis of algorithms.
- Give precise statements about the growth of functions and the complexity of algorithms using the big O, omega, and theta notations.
- Use mathematics terminology, such as sets, sequences, number systems, relations, and functions.
- Write C++ programs to implement various algorithms.

Objectives:
In the process of completing this course, students will:
- Convert numbers between decimal number system, binary number system, and hexadecimal number system.
- Prove mathematical principles using mathematical induction method.
- Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
- Write algorithms for solutions to problems and analyze the complexity of algorithms.
- Build and traverse binary trees.
- Apply the pigeonhole principle to determine if an item has a given property or not.
- Use the language of mathematics: sets, sequences, number systems, relations, and functions.
- Determine the truth values of propositions using truth tables.

- 🐾 Understand and apply the fundamentals of graph theory.
- 🐾 Count objects using permutation and combination methods.

Required or Recommended Textbooks and Materials:

Textbooks:
1. **Required**: zyBooks, register and connect via Canvas before first meeting (cost: $58).
2. **Optional:** *Starting out with C++ From Control Structures through Objects*, 9th Ed., By Tony Gaddis, Pearson
3. **Optional:** *Discrete Mathematics with Applications*, 5th Ed., by Susanna S. Epp, Cengage

Learning Management System: CANVAS:

Canvas (https://scccd.instructure.com/) is used to post announcements, course information, programming assignments, and grade. You will submit your programming assignments on Canvas.
To log-in Reedley College CANVAS:

Username: Your 7-digit student ID number.
Password: If you have not previously changed your password, it is:

First name initial (upper case) + *last name initial* (lowercase) + *date of birth* (mmddyy)
Example: John Smith born on July 9th of 1988   Password =Js070988

Topics:

A. Logic and Proofs
1. Propositions
2. Conditional Propositions and Logical Equivalence
3. Proofs
4. Mathematical Induction
B. Language of Mathematics
1. Sets
2. Sequences and Strings
3. Number Systems
4. Relations
5. Functions
C. Algorithms: Counting Methods, and Recurrence Relations
1. Notation of Algorithms
2. The Euclidean Algorithm and Program Implementation
3. Recursive Algorithms and Program Implementation
4. Complexity of Algorithms
D. Counting Methods and the Pigeonhole Principle
1. Permutations, Combinations, and Program Implementation
2. Binomial Coefficients and Combinatorial Identities
3. The Pigeonhole Principle
E. Graph Theory and Trees
1. Paths and Cycles
2. Hamiltonian Cycles and the Traveling Salesperson Problem
3. Representations of Graphs
F. Trees
1. Terminology and Characterizations of Trees
2. Binary Trees and Program Implementation
3. Tree Traversals and Program Implementation
G. Probability
1. Introduction to Probability

   2. Unions and Intersections
   3. Conditional Probability and Independence
   4. Random Variables
   5. Probability Calculations in Hashing
   6. Conditional Expectations, Recurrences, and Algorithms

Lab Content:
Following lecture content is practiced by students in computer laboratory exercises.
* Algorithms: counting methods and recurrence relations.
* Graph theory.
* Tree traversal.

Tentative Schedule:

	Assignment Points	Date
Week 1: Logic I - Propositions, Logical Operations, & Conditional Statements	**62**	8/10/2020
Optional Reading: Discrete Mathematics with Applications (DMwA) Ch. 1.1, 2.1 - 2.3		
zyBooks Participation Activities	7	8/14/2020
Live Q&A Session online		8/14/2020
POGIL Activities 1, 3, 6	15	8/16/2020
Problem Set	25	8/16/2020
Schedule One-on-One	15	8/16/2020
Week 2: Logic II - Predicates & Qualifiers	**47**	8/17/2020
Optional Reading: DMwA Ch. 3.1 - 3.3		
zyBooks Participation Activities	7	8/21/2020
Live Q&A Session online		8/21/2020
POGIL Activities 4, 5, 7	15	8/23/2020
Problem Set	25	8/23/2020
Week 3: Proofs	**49**	8/24/2020
Optional Reading: DMwA Ch. 4.1-4.7		8/27/2020
zyBooks Participation Activities	9	8/28/2020
Live Q&A Session online		8/31/2020
POGIL Activities 8, 9, 11	15	8/30/2020
Problem Set	25	8/30/2020
Week 4 : Sets	**46**	8/31/2020
Optional Reading: DMwA Ch. 1.2, 6.1, 6.2		
zyBooks Participation Activities	6	9/4/2020
Live Q&A Session online		9/4/2020
POGIL Activities 13, 14, 15	15	9/6/2020
Problem Set	25	9/6/2020
Week 5: Functions & Boolean Algebra	**55**	9/7/2020
Optional Reading: DMwA Ch. 7.1-7.4, 2.4		
zyBooks Participation Activities	10	9/11/2020
Live Q&A Session online		9/11/2020

POGIL Activities 16, 18, 19a, 20		20	9/13/2020
Problem Set Due		25	9/13/2020
Week 6: Exam #1		**50**	9/14/2020
Live Q&A Session online			9/18/2020
Exam #1		50	9/20/2020
Week 7: Relations/Diagraphs		**47**	9/21/2020
Optional Reading: DMwA Ch. 8.1-8.3			
zyBooks Participation Activities		12	9/25/2020
Live Q&A Session online			9/25/2020
POGIL Activities 19b, 21		10	9/27/2020
Problem Set		25	9/27/2020
Week 8: Computation		**33**	9/28/2020
Optional Reading: DMwA Ch. 11.1-11.3, 12.2			
zyBooks Participation Activities		8	10/2/2020
Problem Set		25	10/4/2020
Week 9: Induction & Recursion		**50**	10/5/2020
Optional Reading: DMwA Ch. 5.1-5.4, 5.6, 5.7			
zyBooks Participation Activities		10	10/8/2020
Live Q&A Session online			10/9/2020
POGIL Activities 10, B.10, B.11		15	10/11/2020
Problem Set		25	10/11/2020
Week 10: Algorithms Using Induction & Recursion		**64**	10/12/2020
Optional Reading: DMwA Ch. 5.5			
zyBooks Participation Activities		9	10/16/2020
Live Q&A Session online			10/16/2020
Programming Assignment #1		30	10/18/2020
Problem Set		25	10/18/2020
Week 11: Integer Properties		**61**	10/19/2020
Optional Reading: DMwA Ch. 8.4			
zyBooks Participation Activities		6	10/23/2020
Live Q&A Session online			10/23/2020
Programming Assignment #2		30	10/25/2020
Problem Set		25	10/25/2020
Week 12: Exam #2		**50**	10/26/2020
Live Q&A Session online			10/30/2020
Exam #2		50	11/1/2020
Week 13: Introduction to Counting		**49**	11/2/2020
Optional Reading: DMwA Ch. 7.2, 9.1-9.3, 9.5			
zyBooks Participation Activities		9	11/6/2020
Live Q&A Session online			11/6/2020
POGIL Activities B.1, B.2, B.3		15	11/8/2020
Problem Set		25	11/8/2020
Week 14: Graphs		**44**	11/9/2020
Optional Reading: DMwA Ch. 10.1-10.3			

zyBooks Participation Activities	9	11/12/2020
Live Q&A Session online		11/13/2020
POGIL Exercises B.14, B.15	10	11/15/2020
Problem Set	25	11/15/2020
Week 15: Advanced Counting	**60**	11/16/2020
Optional Reading: DMwA Ch. 9.2, 9.4, 9.7		
zyBooks Participation Activities	5	11/20/2020
Live Q&A Session online		11/20/2020
Problem Set	25	11/22/2020
Programming Assignment #3	30	11/22/2020
Week 16: Trees	**60**	11/23/2020
Optional Reading: DMwA Ch. 10.4-10.6		
zyBooks Participation Activities	5	11/27/2020
Live Q&A Session online		11/27/2020
Problem Set	25	11/29/2020
Programming Assignment #4	30	10/4/2020
Week 17: Discrete Probability	**47**	11/30/2020
Optional Reading: DMwA Ch. 9.1, 9.8, 9.9		
zyBooks Participation Activities	7	12/3/2020
Live Q&A Session online		12/4/2020
POGIL Activities B.4, B.12, B.13	15	12/6/2020
Problem Set	25	12/6/2020
Week 18: Finals Week	**126**	11/30/2020
Professionalism	26	
Final Exam	**100**	12/4/2020
TOTAL	1000	

Subject to Change:
This syllabus and schedule are subject to change. If you are absent from class meeting, it is your responsibility to check on any changes made while you were absent.

Evaluation:
Students will be evaluated on the basis of their performance on various assignments according to the following scale. The instructor reserves the right to adjust scores as it may be required throughout the semester.

Points in the course total 1000 and are distributed as follows:

zyBooks participation activities	119
POGIL activities	170
Problem sets	350
Exams	200
Programming assignments	120
Professionalism, Schedule 1:1	41

Final grade is assigned using following scale:
        900-1000 points A

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800- 899  points   B
700- 799  points   C
600- 699  points   D
< 600 points       F
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Attendance

Attendance for onsite and synchronous online meetings will be taken at beginning of each class. Students who leave before the end of class will be marked tardy. For synchronous online meetings you are expected to have your camera turned on and will have the best experience if you use earbuds/headphones. Please make sure to stay muted until you have a question or something to add so as to cut down on background noise.

Students will be dropped from the class if they fail to attend the first class session of the semester. During the semester up to final drop date, any student who missed two weeks of class meetings (cumulative) will be dropped from this class (i.e. 4 classes).

Make-up tests are limited to students who have made arrangements with the instructor **prior** to the announced testing date or those students who have been excused by High School Attendance Office. Exam material is constructed from class discussions, assigned readings, guest lectures, video presentations, and special assignments. **Unless the student receives prior approval from the instructor, no make-up tests will be allowed.**

Grading Policy

zyBooks Participation Activities:

ZyBooks participation activities must be completed before announced due date (typically at start of class on Thursday for full credit, exception in the first two weeks). These activities allow you to actively engage each week's content. Points will be attributed according to the number of responses required and the percentage of the activities a student completes before class. Reference the following rubric:

Percentage Completed	Before Thursday Points Awarded	After Thursday by End of Week Points Awarded
90%+	100% of points	90% of points
80%+	90% of points	80% of points
70%+	80% of points	70% of points
60%+	70% of points	60% of points
50%+	60% of points	50% of points
25%+	40% of points	30% of points
13%+	20% of points	10% of points

Problem Sets:

Homework exercises are assigned every week and consist of zyBooks challenge activities and other problems. Each assignment is worth 25 points and will be graded based on correctness and functionality. Points will be deducted for late problem sets at 5% per day late, up to one week late (not excepted more than one week late). Problem sets are to be submitted electronically in Canvas and all work must be shown for partial credit. Electronic submissions can be completed in a word processing application or can be scans of work on paper as long as it is easily readable by the instructor. It is up to the student to ensure work is readable before submitting.

POGIL Exercises:

POGIL exercises are assigned in most weeks. Students are to work synchronously in pairs or small groups of 3-4 on their own schedules. It is recommended students meet synchronously early in the week to ensure sufficient time to clarify questions. A weekly discussion forum is available for the group speaker (one of the roles in

POGIL) can communicate questions or feedback to other groups. One submission is to be turned in on Canvas and only one per group. Student names are to be at the top of all documents turned in.

Programming Assignments:
There are four programming assignments in which students will work on their own to address topics from the course. Programs must meet all specifications given. No credit will be given for programs that do not compile or run. Assignments are suggested to be turned in for grading by the due date indicated on the course calendar. However, these can be turned in up to one month later at no penalty (with the exception of those assigned in the last month of the course -- all assignments are due before the final exam). Please be careful as it is not a good idea to get too far behind and the work will build up and you will likely have a difficult time succeeding in the class. Grading is based on the following criteria: functionality, error-proofing/exception handling, efficient use of course concepts, documentation, and readability in addition to test case results. All programming exercises must include your name at the top of all programs submitted, or you will not receive credit.

Exams:
Exams will be administered in weeks 6 (covers weeks 1-5), 12 (covers weeks 7-11), and 18 (cumulative, with some emphasis on weeks 11-18). Exams 1 and 2 are worth 50 points each and the final exam is worth 100 points.

College Policies:

Cheating & Plagiarism, see Cheating and Plagiarism under Campus Policies:

Cheating and plagiarism is prohibited in the class. Incidents of cheating and plagiarism will result a failing grade on the particular assignment in question. Please see Student Conduct Standards at https://www.reedleycollege.edu/about/about-us/policies-and-procedures/student%20conduct%20standards.html for more information about academic integrity.

Each student is expected to assist in the overall environment of the classroom making it conducive to learning.

Accommodations for Students with Disabilities
If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact the Reedley College Disabled Students Programs & Services (DSP&S) Department at (559) 638-0332. You can find more information at https://www.reedleycollege.edu/student-services/disabled-student-programs-and-services/index.html.

Reedley College is committed to creating accessible learning environments consistent with federal and state law. To obtain academic adjustments or auxiliary aids, students must be registered with the DSP&S office on campus. DSP&S can be reached at (559) 638-3332. If you are already registered with the DSP&S office, please provide your Notice of Accommodation form as soon as possible.

Important College Dates Fall 2020

Class begin	Monday	08/10/2020
Last day to drop a full-term class for a full refund	Friday	08/21/2020
Last day to register	Friday	08/28/2020

Last day to drop this class to avoid a "W" in person	Friday	08/28/2020
Last day to drop this class to avoid a "W" on Web	Sunday	08/30/2020
Last date to drop this class	Friday	10/09/2020
No classes, campus is closed		
Labor Day	Monday	09/07/2020
Veterans Day	Wednesday	11/11/2020
Thanksgiving	Thurs-Fri	11/26/2020 –
Final Exam	**Friday**	**12/11/2020**