Spring 2022
CSCI-26
Mathematics for Computer Science
Syllabus

Instructor: Gideon Marsh
Department: Computer Science
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Office Hours: Friday 1-2pm on Zoom or by appointment

Section Number: 50580
Unit(s): 4
Dates: 1/10/2022 – 5/20/2022
Location: Online, Asynchronous

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 successful completion of this course, students will be able to:
- Apply fundamental proving techniques of discrete mathematics, including those by mathematical induction.
- Demonstrate different traversal methods for trees and graphs.
- Give precise statements about the growth of functions and the complexity of algorithms using the big O, omega, and theta notations.
- Use various objects and relationships in discrete mathematics, such as sets, sequences, number systems, relations, and functions.
- Write programs to implement various algorithms that involve topics in discrete mathematics.

Objectives:
In the process of completing this course, students will:
- Demonstrate knowledge of algorithms, recursive algorithms, and the analysis of algorithms.
- Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
- 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.

Student Learning Outcomes are statements about what the discipline faculty hope you will be able to do at the end of the course. This is NOT a guarantee: the ultimate responsibility for whether you will be able to do these things lies with you, the student. In addition, the assessment of Student Learning Outcomes is done by the department in order to evaluate the program as a whole, and not to evaluate individual faculty performance.

Required or Recommended Textbooks and Materials:

Textbooks:

1. **Required**: zyBooks, register and connect via Canvas before first meeting (cost: $58).
    1. Click on your zyBooks link in your learning management system
    (Do not go to the zyBooks website and create a new account)
    2. Subscribe
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 with due dates:

	Assignment Points	Date
Week 1: Logic I - Propositions, Logical Operations, & Conditional Statements	**44**	**1/10**
Optional Reading: Discrete Maths w/ Apps (DMwA) Ch. 1.1, 2.1 - 2.3		
zyBooks Activities	10	1/16
POGIL Discussion Forum Post		1/14
Zoom Office hour @ 1 pm		1/14
POGIL Activities 1, 3, 6	15	1/16
Problem Set	19	1/16
Week 2: Logic II - Predicates & Qualifiers	**46**	**1/17**
Martin Luther King Jr. Day – No classes held, campus closed		**1/17 (Mon)**
Last day to drop a Spring 2022 full-term class for full refund		**1/21 (Fri)**
Optional Reading: DMwA Ch. 3.1 - 3.3		
zyBooks Activities	10	1/23
Zoom Office hour @ 1 pm		1/21
POGIL Discussion Forum Post		1/21
POGIL Activities 4, 5, 7	15	1/23
Problem Set	21	1/23
Week 3: Proofs	**53**	**1/24**
Last day to register for a Spring 2022 full-term class in person		**1/28 (Fri)**
Last day to drop a Spring 2022 full-term class to avoid a "W" in person		**1/28 (Fri)**
Last day to drop a Spring 2022 full-term class to avoid a "W" on WebAdvisor		**1/30 (Sun)**
Optional Reading: DMwA Ch. 4.1-4.7		
zyBooks Activities	10	1/30
Zoom Office hour @ 1 pm		1/28
POGIL Discussion Forum Post		1/28
POGIL Activities 8, 9, 11	15	1/30
Problem Set	28	1/30

Week 4 : Sets	**49**	**1/31**
Optional Reading: DMwA Ch. 1.2, 6.1, 6.2		
zyBooks Activities	10	2/6
Zoom Office hour @ 1 pm		2/4
POGIL Discussion Forum Post		2/4
POGIL Activities 13, 14, 15	15	2/6
Problem Set	24	2/6
Week 5: Functions & Boolean Algebra	**48**	**2/7**
Optional Reading: DMwA Ch. 7.1-7.4, 2.4		
Zoom Office hour @ 1 pm		2/11
zyBooks Activities	10	2/13
POGIL Discussion Forum Post		2/11
POGIL Activities 16, 18, 19a, 20	15	2/13
Problem Set	23	2/13
Week 6: Exam #1	**50**	**2/14**
Exam 1 Live Review @ 1:00 pm		2/14
Exam #1 (available 2/15 - 2/20)	50	2/20
Lincoln Day – no classes held, campus closed		**2/18**
Week 7: Relations/Diagraphs	**49**	**2/21**
Washington Day – no classes held, campus closed		**2/21**
Optional Reading: DMwA Ch. 8.1-8.3		
zyBooks Activities	10	2/27
Zoom Office hour @ 1 pm		2/25
POGIL Discussion Forum Post		2/25
POGIL Activities 19b, 21	15	2/27
Problem Set	24	2/27
Week 8: Computation	**59**	**2/28**
Optional Reading: DMwA Ch. 11.1-11.3, 12.2		
zyBooks Activities	10	3/6
Zoom Office hour @ 1 pm		3/4
Problem Set	23	3/6
Programming Assignment #1	26	3/20
Week 9: Induction & Recursion	**49**	**3/7**
Last Day to drop a full-term class		**3/11 (Fri)**
Optional Reading: DMwA Ch. 5.1-5.4, 5.6, 5.7		
zyBooks Activities	10	3/13
Zoom Office hour @ 1 pm		3/11
POGIL Discussion Forum Post		3/11
POGIL Activities 10, B.10, B.11	15	3/13
Problem Set	24	3/13
Week 10: Algorithms Using Induction & Recursion	**69**	**3/14**
Optional Reading: DMwA Ch. 5.5		
zyBooks Activities	10	3/20
Zoom Office hour @ 1 pm		3/18
Problem Set	28	3/20
Programming Assignment #2	31	4/3

Week 11: Integer Properties	**56**	**3/21**
Optional Reading: DMwA Ch. 8.4		
zyBooks Activities	10	3/27
Zoom Office hour @ 1 pm		3/25
Problem Set	15	3/27
Programming Assignment #3	31	4/10
Week 12: Exam #2	**50**	**3/28**
Exam 2 Live Review @ 1:00 pm		3/28
Exam #2 (available 3/29 - 4/3)	50	4/3
Zoom Office hour @ 1 pm		4/1
Week 13: Introduction to Counting	**44**	**4/4**
Optional Reading: DMwA Ch. 7.2, 9.1-9.3, 9.5		
zyBooks Activities	10	4/10
Zoom Office hour @ 1 pm		4/8
POGIL Discussion Forum Post		4/8
POGIL Activities B.1, B.2, B.3	15	4/10
Problem Set	19	4/10
Spring Recess (no classes held, campus open)		**4/11 – 4/15**
Week 14: Graphs	**53**	**4/18**
Optional Reading: DMwA Ch. 10.1-10.3		
zyBooks Activities	10	4/24
Zoom Office hour @ 1 pm		4/22
POGIL Discussion Forum Post		4/22
POGIL Exercises B.14, B.15	15	4/24
Problem Set	28	4/24
Week 15: Advanced Counting	**64**	**4/25**
Optional Reading: DMwA Ch. 9.2, 9.4, 9.6, 9.7		
zyBooks Activities	10	5/1
Zoom Office hour @ 1 pm		4/29
Problem Set	23	5/1
Programming Assignment #4	31	5/15
Week 16: Trees	**69**	**5/2**
Optional Reading: DMwA Ch. 10.4-10.6		
zyBooks Activities	10	5/8
Zoom Office hour @ 1 pm		5/6
Problem Set	28	5/8
Programming Assignment #5	31	5/20
Week 17: Discrete Probability	**48**	**5/9**
Optional Reading: DMwA Ch. 9.1, 9.8, 9.9		
zyBooks Activities	10	5/15
Final Exam Live Review @ 1:00 pm		5/12
Zoom Office hour @ 1 pm		5/13
POGIL Discussion Forum Post		5/13
POGIL Activities B.4, B.12, B.13	15	5/15
Problem Set	23	5/15

Week 18: Finals Week	100	5/16
Final Exam (available starting 5/16, due by 5/20 at Noon)	100	5/20
End of Spring 2022 Semester / commencement		**5/20**
TOTAL POINTS	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 activities	150
POGIL activities	150
Problem sets	350
Exams	200
Programming assignments	150

Final grade is assigned using following scale:

900 -1000 points	A
800 - 899 points	B
700 - 799 points	C
600 - 699 points	D
< 600 points	F

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 participate in the first week of the semester. During the semester up to final drop date, any student who missed two weeks of class participation (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 11:59 pm on the Sunday after they are assigned). 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:

Problem Sets:
Homework exercises are assigned every week and consist of the problems at the end of the zyBooks sections. Each assignment will be graded based on correctness and functionality. 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) to respond to questions in the assignment or pose questions to the instructor 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 five 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 to be turned in for grading by the due date indicated on the course calendar, which is typically 3 weeks after being assigned (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.

Course and College Policies:

Access to Technology
This course is conducted asynchronously online. Students will need access to a reliable computer and reasonably fast internet access. If you are or know of a student who might benefit, please share that Reedley College has available laptops and accessories to loan to students as needed. Please contact the technology department at 559-637-2555.

Late Policy
All assignments, except for POGIL exercises, can be turned in late with a penalty of only being able to earn up to 50% of the points of the assignment. POGIL exercises will not be accepted late as these are group endeavors. All assignments, late or otherwise, are due before the final exam. Problem sets are to be submitted electronically in Canvas and all work must be shown for partial credit.

Communication Policy
Communication is vital to success in this course. Please know that although we may not be physically meeting this semester, I as your instructor am here to help. The best ways to get in contact with me are to visit office hours, by inbox message, or by email. I typically respond within 24 hours, often less. If you do not receive a response within this time period, please assume there was some error in communication and try again or use a different means. Please include the course name and a brief summary describing the content of the message in the subject field of all electronic communication. Always use the email address provided by the college for communication and ensure that it is checked regularly.

Online Attendance Policy
Student engagement in submitting course deliverable serve as proof of engagement in this course. As a result, students who do not communicate with the instructor nor submit an assignment in the first week will be dropped automatically from the course. Students who go two weeks without submitting an assignment or do not communicate with the instructor will be dropped before the college's announced last date to drop a class to avoid a 'W' (please see course schedule). Students who are considering dropping this class are asked to consider this resource and please contact the instructor.

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.

Code created by external sources can be utilized with permission from the instructor and 1) must be properly documented so as not to plagiarize the work of others and 2) must not make up more than 10% of the actual code (exclusive of documentation) of the project.

It is expected each student will do his/her own work unless otherwise instructed. This course involves both individual work and collaborative work. It is your responsibility to understand the guidelines that apply to each kind of work, and to be clear about which assignments are individual assignments and which are collaborative.

Activities not designated as cooperative assignments in this course are to be done individually. Individual work is to be carried out entirely and solely by an individual. Programs, homework sets, and exam responses will be checked for plagiarism using both computer and human similarity checkers. Take extreme precautions that your individual work is not viewed by other students. This includes deleting all your computer files from public workstations when you are finished, retaining private permissions on your files, destroying printouts of source code, and not letting other students use your personal computer where you store your coursework.

In addition, the work you submit must be entirely your original creation. Using solutions from any other source is forbidden; in particular, using solutions (either instructors' or other students') from previous offerings of this or other courses is not allowed. Using solutions found on the Internet or getting help from online forums is not allowed.

Assignments which appear to be the result of a "group effort", or appear to have been copied from another student, will be considered plagiarized. Violations of this policy will be reported as violation of academic integrity per college policy.

In-class activities are designated as pair or team activities. Students will be assigned a partner or will self-assign to complete these activities. Be sure to use these collaborative activities as a chance to master the skills, as there will be quizzes in which each person must perform the skills individually.

Accommodations for Students
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.