

SYLLABUS: Computing Structures
CS 191, Section 2, VH 1208
Spring 2023

Instructor: Dr. Alan Garvey
Office: VH 2166
Phone: x7600
E-Mail: agarvey@truman.edu (in general I will respond within 24 hours, often much more quickly, perhaps as much as 48 hour response times on weekends, sometimes.)
Website: Generally, course information is available on the class webpage on my web server at: <http://vh216602.truman.edu/agarvey> Additional course information including the gradebook is available on Blackboard.

Office Hours: MWF 7:30-8:30am, 10:30-11:30am, Tu 9am-Noon

Please review important support instructions for online learners available at online.truman.edu. This site will provide you with the most up-to-date information on important University resources and where to access them.

WELCOME

I'm glad you are taking this course. We will study several important underlying mathematical concepts that are relevant for computer science. This class will help provide you with a solid theoretical foundation for learning computer science.

REQUIRED TEXTBOOK & OTHER RESOURCE INFORMATION

Required Reading Material (Books for Purchase)

Discrete Structures, Logic, and Computability by James L. Hein, Jones & Bartlett Publishers, 2017, Fourth Edition. Previous editions are not acceptable. I will not require you to use the Digital Resources for Students, so a used textbook is fine. This is the same textbook we use for CS 291, so renting is probably not your best option.

Required Reading Material (Accessible Articles or Chapters Online – Not for Purchase)

A Prolog Lab book from Hein available as a pdf at: [PrologLabBook09.pdf](#)

Bookstore Website: <https://www.bkstr.com/trumanstatestore/home>

Truman Library Website: <http://library.truman.edu/>

PREREQUISITES, MINIMUM TECHNOLOGY, AND SKILL REQUIREMENTS

Prerequisites

A grade of C or better in CS 180 - Foundations of Computer Science I) and completion of Elementary Functions Essential Skill (MATH 156 - College Algebra and MATH 157 - Plane Trigonometry or MATH 186 - Precalculus or MATH 192 - Essentials of Calculus or MATH 198 - Analytic Geometry and Calculus I).

Minimum Technology Requirements

To successfully participate in this course, you need:

- Reliable broadband internet connection (Cable modem, DSL, or satellite)
- Relatively new operating system so that you can get technical support if needed (Windows 7 or newer, Mac OSX, etc.)

- Internet browser compatible with Blackboard, such as Firefox or Chrome or Safari. See [Blackboard's help page](#) for more details.
- Computer with speakers for listening to videos, microphone, and camera

Minimum Technical Skills

To be successful in the course, you need to be able to:

- Access the internet and navigate websites using a web browser
- Use word processing to complete written assignments
- Navigate Blackboard and use it to submit assignments
- Be comfortable using Zoom for synchronous class work and office hours
- Be comfortable using your computer microphone, speakers, and video camera.
- Send and receive email, **and check your email at least once daily.**
- Access the library and other online resources when off campus by using a [VPN](#) or view.truman.edu.
- Access the Department Linux server (ice.truman.edu) and navigate your way through the Linux environment, if you choose to use this server.

Technical Expectations for Completing Assignments and Exams

The exams for this course will be in person paper exams, given during regular class time. The final exam will be given in our regular classroom during our scheduled final exam time. To complete assignments you need to be able to navigate the class web site and prepare documents using LaTeX. Assignments will be made available through the class web site and submitted using the Assignment Submission form on the [vh216602](#) server. If you have a problem submitting an assignment you should email me an attachment of your work, but this should only be used if the Assignment Submission form fails.

GENERAL COURSE INFORMATION

Introduction to the Course

This course is an introduction to aspects of discrete math that are especially relevant for computer science. CS 191 is kind of a set of separate topics, such as proof methods, counting techniques, properties of functions, graphs, and the mathematics underlying analysis of algorithms. Study of this material will be continued in CS 291, which uses the second half of the textbook. Another way of thinking about it is that we are looking at the topic of discrete mathematics from a computer science perspective.

Course Description

Uses the computer as a tool to introduce discrete structures and techniques for computing. Analysis of algorithms, methods of proof, counting techniques, and discrete probability.

Course Objectives

- Understand discrete mathematical concepts such as: combinatorics, sets, functions, induction, recursion and algorithm analysis.
- Use the computational examples and ideas to explore these mathematical concepts.
- Use LATEX to compose readable mathematical writing and general textual presentations.
- Get an introduction to logic programming using the Prolog language.

Learning Outcomes

After taking this course, the student should be able to:

- Use a mathematical document preparation system to clearly and concisely frame mathematical arguments and illustrations.
- Explain with examples the basic terminology of functions, relations, and sets.
- Perform the operations associated with sets, functions, and relations.
- Relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
- Convert logical statements from informal language to propositional and predicate logic expressions.
- Apply formal methods of symbolic propositional and predicate logic, such as calculating validity of formulae and computing normal forms.
- Use the rules of inference to construct proofs in propositional and predicate logic.
- Describe how symbolic logic can be used to model real-life situations or applications, including those arising in computing contexts such as software analysis (e.g., program correctness), database queries, and algorithms.
- Apply formal logic proofs or informal, but rigorous, logical reasoning, to real problems, such as predicting the behavior of software or solving problems such as puzzles.
- Describe the strengths and limitations of propositional and predicate logic.
- Identify the proof technique used in a given proof.
- Outline the basic structure of each proof technique (direct proof, proof by contradiction, and induction) described in this unit.
- Apply each of the proof techniques (direct proof, proof by contradiction, and induction) correctly in the construction of a sound argument.
- Determine which type of proof is best for a given problem. [Assessment] Explain the parallels between ideas of mathematical or structural induction to recursion and recursively defined structures.
- Explain the relationship between weak and strong induction and give examples of the appropriate use of each.
- State the well-ordering principle and its relationship to mathematical induction.
- Apply counting arguments, including sum and product rules, inclusion-exclusion principle and arithmetic or geometric progressions.
- Apply the pigeonhole principle in the context of a formal proof.
- Compute permutations and combinations of a set, and interpret the meaning in the context of the particular application.
- Map real-world applications to appropriate counting formalisms, such as determining the number of ways to arrange people around a table, subject to constraints on the seating arrangement, or the number of ways to determine certain hands in cards (e.g., a full house).
- Solve a variety of basic recurrence relations.
- Analyze a problem to determine underlying recurrence relations.
- Perform computations involving modular arithmetic.
- Calculate probabilities of events and expectations of random variables for elementary problems such as games of chance.
- Differentiate between dependent and independent events.

Availability of Course Content

Course content will be available on a combination of Blackboard and the class website (vh216602.truman.edu/agarvey)

Proctoring

Exams will be closed book, with the understanding that students will work on them individually, not consulting with other people.

Credit Hour Justification:

The minimum investment of time by the average Truman student necessary to achieve the learning goals in this course are not less than one hour (50 minutes) of classroom instruction and a minimum of two hours of out of class student work each week per credit hour awarded. This average time per week for an average student may have weekly variations.

IMPORTANT UNIVERSITY POLICIES AND PROCEDURES

Disability Services:

To obtain disability-related academic accommodations students with documented disabilities must contact the course instructor and the Office of Student Access and Disability Services (OSA) as soon as possible. Truman complies with ADA requirements. For additional information, refer to the Office of Student Access and Disability Services website at <https://disabilityservices.truman.edu/>. You may also contact OSA by phone at (660) 785-4478 or studentaccess@truman.edu.

Emergency Procedures:

In each classroom on campus, there is a poster of emergency procedures explaining best practices in the event of an active shooter/hostile intruder, fire, severe weather, bomb threat, power outage, and medical emergency. This poster is also available as a PDF at this link: <http://police.truman.edu/files/2015/12/Emergency-Procedures.pdf>. Students should be aware of the classroom environment and note the exits for the room and building. For more detailed information about emergency procedures, please consult the Emergency Guide for Academic Buildings, available at following link: <http://police.truman.edu/emergency-procedures/academic-buildings/>

This six-minute video provides some basic information on how to react in the event there is an active shooter in your location: <http://police.truman.edu/emergency-procedures/active-shooter/active-shooter-preparedness-video/>.

Truman students, faculty, and staff can sign up for the TruAlert emergency text messaging service via TruView. TruAlert sends a text message to all enrolled cell phones in the event of an emergency at the University. To register, sign in to TruView and click on the "Truman" tab. Click on the registration link in the lower right of the page under the "Update and View My Personal Information" channel on the "Update Emergency Text Messaging Information" link. During a campus emergency, information will also be posted on the TruAlert website <http://trualert.truman.edu/>.

Discrimination and Title IX:

Truman State University, in compliance with applicable laws and recognizing its deeper commitment to equity, diversity and inclusion, which enhances accessibility and promotes excellence in all aspects of the Truman Experience, does not discriminate on the basis of age, color, disability, national origin, race, religion, retaliation, sex (including pregnancy), sexual orientation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Faculty and staff are considered "mandated reporters" and therefore are required to report potential violations of

the University's Anti-Discrimination Policies to the Institutional Compliance Officer.

Title IX prohibits sex harassment, sexual assault, intimate partner violence, stalking and retaliation. Truman State University encourages individuals who believe they may have been impacted by sexual or gender-based discrimination to consult with the Title IX Coordinator who is available to speak in depth about the resources and options. Faculty and staff are considered "mandated reporters" and therefore are required to report potential incidents of sexual misconduct that they become aware of to the Title IX Coordinator.

For more information on discrimination or Title IX, or to file a complaint contact:

Ryan Nely, Institutional Compliance Officer, Title IX and Section 504 Coordinator
Office of Institutional Compliance
Violette Hall, Room 1308
100 E. Normal Ave
Kirksville, MO 63501
Phone: (660) 785-4354
titleix@truman.edu

The institution's complaint procedure can be viewed at: <http://titleix.truman.edu/files/2015/08/University-Complaint-Reporting-Resolution-Procedure.pdf> and the complaint form is accessible at <http://titleix.truman.edu/make-a-report/>

IMPORTANT CONTACTS

Various offices that provide services to online students are identified at the [One Stop Services](#) page on online.truman.edu. Should you need to consult with administrators that oversee this department and course, here is the contact information for those individuals:

Computer Science Department Chair: Alan Garvey
Violette Hall 2166
785-7600
agarvey@truman.edu

Dean, School of Science and Mathematics: Dr. Tim Walston
Magruder Hall 2004
785-4248
samdean@truman.edu

Hopefully your experience with this class is positive. When and if you feel a complaint about this or another course is required, however, the procedure for lodging a complaint can be found on the University's [Report a Complaint](#) page. Students taking an online course from outside of the state of Missouri should follow the complaint procedure [offered here](#). **Students are always asked to address their complaint to the professor of the course first when possible, then take their concerns to the Department Chair if the matter cannot be resolved with the faculty member.**

LEARNER SUPPORT

The University provides a range of both academic and student support services to ensure your success. These offices can advise you on learning strategies, point you toward valuable services, and help you troubleshoot technical problems as they arise.

Center for Academic Excellence

[The Center for Academic Excellence](#) provides advising services for students in their first year for most departments, as well as

tutoring services. The Center is located in PML 109 and it may be reached at 660-785-7403.

Counseling Services

[Counseling Services](#) are available on campus at McKinney Center. Appointments may be scheduled by calling (660) 785-4014. An after-hours crisis line is also available at 660-665-5621.

IT Help Desk

The [IT Service Center](#) has combined the IT Call Center, Help Desk and Telephone Services into a one-stop location to serve you. You will find the following services and more when you stop by Pickler Library 203 or call 660-785-4544. You may submit a customer support ticket at [this web address](#).

Office of Student Access and Disability Services

To obtain disability-related academic accommodations students with documented disabilities must contact the course instructor and the Office of Student Access and Disability Services (OSA) as soon as possible. Truman complies with ADA requirements. For additional information, refer to the Office of Student Access and Disability Services website at <http://disabilityservices.truman.edu/>

You may also contact OSA by phone at (660) 785-4478 or email studentaccess@truman.edu

IMPORTANT DATES

For more information on drop and add dates and fees, see the [registrar's schedule](#).

Start Date: Tuesday, January 17, 2023

End Date of On-Campus Meetings: Friday, May 12, 2023 (last day of Finals)

Last Day of the Full Semester: Friday, May 5

Drop Dates: Last day to drop a course without a grade of "W" appearing on your transcript and no fee is January 23.

Last day to drop a course without a grade of "W" appearing on your transcript but WITH a \$50 fee is Friday, February 10.

Last day to change to credit/no credit grading option is Friday, May 5.

Last day to drop the class WITH a grade of "W" appearing on your transcript is Friday, May 5.

Withdrawal Date: May 5 is the last day to withdraw from ALL classes with no refund.

DISCIPLINE-SPECIFIC INFORMATION

Information on the Computer Science major can be accessed via the [CS Department Website](#) or the [CS Catalog Description](#).

ATTENDANCE/PARTICIPATION

University Policy

The University-wide attendance policy can be viewed [here](#).

Definition of Attendance for This Course

Attendance (based on the General Catalog and Faculty Senate SB516: University Policy on Class Attendance):

Students with sanctioned absences will not be penalized for being absent, but will be expected to make up any missed work within a reasonable length of time. The professor reserves the right to deem additional absences as unsanctioned once a student has missed 6.67% of class time for sanctioned absences. A list of sanctioned absences can be found in the [General](#)

[Catalog](#). Sanctioned absences include serving as a representative of the University at intercollegiate athletic events, professional conferences, academic competitions, field trips for courses, interviews for graduate school or careers, health-related absences (with documentation), and absences covered by Truman's non-discrimination policy. For an absence to be sanctioned, students must notify the professor of scheduled absences during the free add/drop period and as soon as possible for any other absences. Students should also provide the faculty member with written notification of the absence. Arrangements for making up prior work should be made prior to the absence. If the absence is unexpected, the student should arrange to make up the missed work as soon as possible. An appeal of a faculty member's attendance policy can be made through the University Grade Appeals process (see the General Catalog for details).

Class attendance is your responsibility. I understand that you will occasionally have to miss class. However, whether you are in class or not you will be responsible for all deadlines and all materials taught or assigned. Graded activities such as tests, quizzes, labs, in-class projects, etc. . . may *not* be made up. Exceptions to this will be at my discretion and must be arranged with me **before** the missed class. Be aware that in class I will cover significant amounts of material that is not covered by the textbook.

SUBSTANTIVE INTERACTION

Truman policy and federal regulations require that students demonstrate that they are academically engaged in the courses they take. You must meet this requirement within the first calendar week of the semester, beginning at 12:00 am on Tuesday **January 17** and ending 11:59 pm Monday **January 23**. Failure to do so, or to provide an explanation of an extenuating circumstance by that date and time will result in your removal from the course. Under certain circumstances, removal could impact your scholarship eligibility or financial aid. **For the purposes of this class, establishing academic engagement requires, at a minimum, attending class in person on either Wednesday, January 18 or Friday, January 20 (preferably both). If you do not attend either of these class sessions, contact me by email to arrange an alternate way of meeting this requirement.**

GRADING

- 40% for homework and programming assignments (roughly ten homework assignments, possibly including some programming components, during the semester)
- 60% for three in-class exams and the cumulative final

Your final grade will be determined using the following scale:

- 100-90% A
- 89-80% B
- 79-70% C
- 69-60% D
- 59-below F

Final Exam:

The final exam for this course will be held at the time indicated in the Registrar's final Exam Schedule found at:

<https://www.truman.edu/majors-programs/academic-resources/academic-calendar-schedules/final-exam-schedules/spring-2022/>.

For this class, that is 9:30-11:20am on Tuesday, May 9, 2023 in VH 1208

ASSIGNMENTS

Homework Assignments

You will use LaTeX to prepare solutions to assigned problems mostly from the textbook. We will briefly cover LaTeX in class and I will give you templates that guide you in the commands needed for the particular homework problems. You can use LaTeX in the Truman Windows image or on the departmental Linux server or at the very easy to use Overleaf website. You will upload pdf files produced by the LaTeX installation. One or two homework assignments may also use the Prolog logic programming language as described in class.

EXAMS

In class exams

There will be three in-class exams given during the semester. You will get at least 10 days notice before each exam and a study guide will be provided. These exams will each be worth 100 points.

Final Exam

The Final exam will be from 9:30-11:20am on Tuesday, May 9, which is our regularly scheduled final exam time. This exam will be worth 200 points and will be cumulative.

STUDENTS' AND INSTRUCTOR'S EXPECTATIONS

My Expectations of Students

I expect students to read the relevant sections of the textbook, participate in person in the class lectures that cover the course material (also provided on slides), submit homework assignments when they are due, prepare for and pass the three, hour-long exams, plus the two-hour long final exam. I expect students to engage with the class, ask questions when they have them, and learn the concepts.

What Students Should Expect of Me as Their Instructor

During this course I will: respond to email within 24 hours, usually much more quickly, except maybe 48 hours on weekends; update you on any changes to our course in a timely manner; provide timely feedback on questions, activities, and assessments (no more than a week turn-around time, if work is submitted on time); make you aware of concerns I have with your performance or ability to succeed in the course; be available as a source of support in your learning.

If at any time I am forced to step away from the course for more than 48 hours, such as in the case of illness or personal emergency, I will notify the class as soon as possible and (if necessary) provide an additional point of contact for further information.

STUDENT ENGAGEMENT

Learner Interaction

I encourage students to interact with me and ask questions in class, during office hours, and via email. Email is especially useful for technical questions related to homework problems and programming assignments. Email me what you have (as an attachment, usually) and ask about what isn't working or you find confusing (or just indicate that you are lost). I am happy to Zoom with you during office hours to talk through questions more related to understanding of concepts. It is also helpful to ask these kind of questions during class meetings, so that the whole class can hear the question and my response.

NETIQUETTE AND CIVIL DIALOG

As members of the Truman State University community online or on-campus, we all deserve the consideration and respect of one another as we go through this course. We should all be practicing basic courtesy. My office and classroom (including online spaces) are safe and welcoming environments for all students. I am entering this course under the assumption that everyone wants to be here and is excited about our topics. I expect us to treat everyone with respect.

When contacting a classmate or me via email, please follow basic etiquette guidelines that make online communication more efficient: Use a clear (but concise) subject line that conveys some sense of the email's contents. Use the proper name or title for your addressee; err on the side of being overly formal if you're not sure what name or title they prefer. Make sure that your audience has all the information they need in order to offer you a helpful response. This includes things like your name, the name of the class, and the assignment in question. Remember that we all (especially your professors) get a lot of email every day. If your message is not clear, you won't get the best response.

ACADEMIC HONESTY

"ACADEMIC HONESTY – Personal and scholarly integrity are expected of everyone in the class. Failure to live up to those responsibilities, risks earning a failing grade on the assignment/examination, a failing grade for the course, and/or in serious cases expulsion for the academic program or University. The University policy on academic dishonesty as published in the Student Conduct Code and General/Graduate Catalog applies."

(http://catalog.truman.edu/content.php?catoid=13&navoid=625&hl=academic+dishonesty&returnto=search#Academic_Dishonesty).

Anyone submitting work to be graded which, in my estimation and beyond reasonable doubt, is not his or her work alone will receive an F. **No group work is allowed unless I explicitly indicate that you can work in groups.** When you do hand in group work, you must **always** indicate that it is group work and who was involved in it. You are welcome to discuss assignments with anyone, but all work you hand in must be your own. Corrolary: If you provide work you produce to others, you are aiding and abetting their dishonesty and thus being dishonest yourself. Providing your work to others or giving answers to others is not acceptable.

STUDENT SURVEY OF INSTRUCTION

You will be asked to complete a survey regarding my instruction in this course at the end of the term. The survey is anonymous and I will not see the results until after grades have been completed. It is very important that I receive this feedback as it helps me to continuously improve this class. It also helps the University make decisions about our overall curriculum. Please be sure to participate in this survey opportunity.