# CSCE 4115 Formal Languages, Automata, and Computability

## Syllabus: Fall 2025

**Instructor:** Bahareh Dorri

**Office:** E235F

**Office hours**: 11:00 am - 12:00 pm Mondays & Wednesdays

**Email:** Bahareh.mokarramdorri@unt.edu

**Class Time:** 8:30 am - 9:50 am Mondays & Wednesdays

**Place:** E266

**IA:** Sai Vijay Sankar Bheemana

**Email:** SaiVijaySankarBheemana@my.unt.edu

**Office:** TBA

**Office hours (in-person):** 11:00 am - 12:00 pm Mondays

**Office hours (online):**11:00 am - 12:00 pm Wednesdays via Zoom (link), Meeting ID: 810 4386 2595

**TA:** Lang Zhou

**Email:** LangZhou@my.unt.edu

**Office:** Cubicle F

**Office hours (in-person):** 2:00 pm - 3:00 pm Wednesdays

**Office hours (online):** 3:00 PM - 4:00 PM Wednesdays via Zoom (link)

**Communication Expectations:**

Connect with me through email and/or by attending office hours. I will strive to respond to your emails within 1 business day and make grades of each homework/exam within two weeks after the due date. Please write the course number in your email subject line. If you contact me and do not receive a response within two business days, please send a follow up email. A gentle nudge is always appreciated. I reserve the right to modify course policies, the course calendar, assignment or project point values, and due dates.

All course related announcements will be on Canvas. Please setup your notification settings to avoid missing any announcements. Please check CLEAR Online Communication Tips at https://clear.unt.edu/online-communication-tips.

**Textbook**

· *Introduction to the Theory of Computation*, 3e, Michael Sipser

· (Not required) *Introduction to Automata Theory, Languages, and Computation,* 3rd Ed., John E. Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, Pearson, 2007, ISBN 0-321-45536-3

**Course Description**

Introduction to formal language theory that underlies modern computer science. Topics include different representational forms for regular languages, context-free grammars, pushdown automata, pumping lemmas for regular and context-free languages, and Chomsky's hierarchy.

**Learning Outcomes**

By the end of the course, you will

· Convert a regular expression to an equivalent NFA or DFA.

· Apply the pumping lemma for regular languages to prove that a given non-regular language is, in fact not regular.

· Apply the pumping lemma for context-free languages to prove that, given a grammar, G, that is not context-free that G, in fact, is not context-free.

· Prove that any context-free grammar, G, can be converted to a pushdown automata that accepts the same language as G.

· Describe the concept of undecidability, give an example of an undecidable language, UL, and prove that UL is undecidable.

· Demonstrate that a "real" computer can be simulated by a Turing machine.

· Demonstrate the concept of NP-completeness, give an example of an NP-complete problem, NPCP, and prove that NPCP is NP-complete.

*Course outcomes are measurable achievements to be accomplished by the completion of a course. These outcomes are evaluated as part of our ABET accreditation process.*

**Prerequisites**

CSCE 2100 and CSCE 2110 (Computing Foundations I; Computing Foundations II) with a grade of C or better

**Grading**

- Exam 1 25%
- Exam 2 25%
- Assignments/Quizzes 25%
- Exam 3 25%

**A: 90-100; B: 80-89; C: 70-79; D: 60-69; F <60**

**Tentative Course Schedule:**

| **Week** | **Topics** | **Assignment** |
|---|---|---|
| 1 | Regular Languages | |
| 2 | Regular Expressions | |
| 3 | Regular Expressions | Assignment 1 |
| 4 | Grammar & NFA | |
| 5 | NFA & GNFA | Assignment 2 |
| 6 | Context-free languages | |
| 7 | Context-free languages | |
| 8 | Exam 1 | Assignment 3 |
| 9 | Pushdown Automata | |
| 10 | Pushdown Automata & Turing Machine | Assignment 4 |

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|---|---|---|
| 11 | Turing Machine | Assignment 5 |
| 12 | Decidability & Undecidability | |
| 13 | Exam 2 | |
| 14 | NP-completeness | Assignment 6 |
| 15 | Thanksgiving (No class) | |
| 16 | Review & Exam 3 | |

This course has digital components. To fully participate in this class, students will need internet access to reference content on the Canvas Learning Management System. If circumstances change, you will be informed of other technical needs to access course content. Information on how to be successful in a digital learning environment can be found at Learn Anywhere (https://online.unt.edu/learn).

No late assignments will be accepted!
Students are expected and encouraged to attend classes. Students will be responsible for any missing assignments or announcements. The absence reason could be anything including university sponsored events. Also, the student's absence does not change the due date of any assignment.

**Assignments & Quizzes:** Assignments must be turned in on their due dates. Late submissions may be allowed up to 24 hours after the due date with a 20% penalty on the grade for that assignment. Submissions after the grace period will not be accepted!

**We do not accept assignments submission by email.**
Quizzes will be announced in advance and will be performed in class.

Grades will be posted on Canvas throughout the semester to provide an ongoing assessment of student progress, but typically about 10-15 calendar days after the assignment was due. Grading discussion should first go to the IA/TA graded your assignment in 5 calendar days after grades posted, but if a resolution cannot be reached between the student and the grader, then you should go to the instructor who will have the final decision on the grade. After 5 calendar days, barring an exceptional circumstance, grades will not be altered.

It is the student's responsibility to check any given grade and make complaints within at most two weeks after the grades are announced. Grades will not be changed afterwards. Make-ups must need the instructor's special permission. In most cases, they are not allowed.

Students will be notified by Eagle Alert if there is a campus closing that will impact a class and describe

that the calendar is subject to change, citing the Campus Closures Policy (https://policy.unt.edu/policy/15-006).

**Make-up Work Policy**

For most situations there will be no make-up work for any assessment in this course. However, in the event of an unavoidable absence for one of the reasons below, email me as soon as possible so we can work out a solution. The following events are grounds for make-up work: being a participant in a conference in which you are presenting; being in an athletic or other UNT associated event in which you are an active participant; a family emergency; a severe illness; military duty; or in certain cases and with some restrictions a religious event. Additionally, in the case of a missed assignment due to illness, make-up work will only be allowed by the instructor to receive further notification from the **Dean of Students**. Students are responsible for sending an email to the **Dean of Students** with a physical copy of a signed doctor's note. See the UNT Attendance Policy for more information.
A student is responsible for requesting an excused absence in writing, providing satisfactory evidence to the **Dean of Students** (**deanofstudents@unt.edu**) to substantiate excused absence, and the Dean of Students will send the notification to the faculty member assigned to the course for which the student will be absent. When an absence is excused, the faculty member will provide a reasonable time after the absence for the student to complete the assignment.

**Academic Integrity**

Standards in this course are consistent with UNT policy: STUDENT STANDARDS OF ACADEMIC INTEGRITY (18.1.16), or other related/existing UNT policies. The work that you turn in to be graded, including any underlying ideas, must be your own individual work. Usage of unauthorized material and sources, or depending on any unauthorized assistance, to answer homework problems, test questions, writing reports, or carrying any type of assignment, etc., without the permission of the instructor, or without complete and accurate and complete attribution/citation of the source, when applicable, is viewed as an academic misconduct.

All department policies on Academic Integrity and Student Conduct apply for this course – these are available at the following webpage:
http://cse.unt.edu/resources/cse_integrity_policy.html
Any exceptions to this policy are noted explicitly in the syllabus.
Please find the Department Academic Integrity Guidelines here.

**Assignment 1 Already RELEASED**: Please make sure to take the "Academic Integrity" quiz that is available on Canvas.

**Cheating Policy:**

· Using information from a homework helper site (including AI based services like Chat GPT) is CHEATING

· Duplicating/nearly duplication answers from another student/another groups submission is CHEATING

· First Offense: 0 for the entire submission

· Second Offense: F for the course

**Disabilities Accommodation**

The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

**Syllabus Revisions**

This syllabus may be modified as the course progresses should the instructor deem it necessary. Notice of changes to the syllabus shall be made through Canvas and/or in-class announcements.