CSCE 4110: Algorithms

Instructor: Jonathon Doran, Jonathon.Doran@unt.edu

Class Meeting:  Mon/Wed 2:30pm-3:50pm
Office Hours:  Tues 2:00pm-3:00pm, Wed 4:00pm-5:00pm at CHEC 148 or via Zoom. Note that some Wednesdays I may be at Denton at a location to be announced.

Also via appointments. Feel free to email me times that you are available

Email: Jonathon.Doran@unt.edu

Communication Expectations: The best way to reach me outside of class/office hours is via email. During the week I will respond to your email within 24 hours. During the weekend, response time may be longer. This includes personal concerns or questions about the class or an assignment. The TA’s and I strive to get grades back between 1-1.5 weeks from the due date, though that is not always possible when the class is large. Communication is expected to be professional and respectful. Online Communication Tips (https://clear.unt.edu/online-communication-tips) are available. Please include "CSCE 4110" in the subject line of all emails.

Welcome to UNT!

Welcome to those of you who are just joining us. Please know that as members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT’s full Non-Discrimination Policy can be found in the UNT Policies section of this syllabus.

Course Description:

Time complexity of algorithms; algorithm design methodologies including divide and conquer, greedy, and dynamic programming; exposure to approximation algorithms for NP-hard problems; performance evaluation of algorithms.

Course Structure:

This course is 3 credits, and meets in-person over one semester (14 weeks).

You will work individually on some assignments and in small groups for others.

The course calendar is presented later in this syllabus so that you can see the pace of this course and the due dates. Please keep in mind that the schedule may change slightly as the semester progresses to better meet the needs of students.
Course Prerequisites and Other Restrictions

You are expected to have completed CSCE 3110 (Data Structures and Algorithms) prior to taking this course. This means that you have also completed CSCE 2100 (Computing Foundations I) and CSCE 2110 (Computing Foundations II) prior to taking this course. And in turn CSCE 1030 (Computer Science I) and CSCE 1040 (Computer Science II) as well. You should be comfortable designing and writing programs, and have a basic knowledge of data structures and algorithms.

Objectives:

Students should gain these skills by the end of the course:

- Be able to analyze the time and space complexity of a nontrivial algorithm, using mathematical tools, and prove/justify the correctness.
- Understand the Divide and Conquer, Greedy, and Dynamic Programming strategies for algorithmic design.
- Be familiar with the algorithms for Matrix Multiplication (Strassens), Activity Selection, Knapsack, Shortest Paths (single source, and all pairs), Minimum Spanning Tree (Prims and Kruskals), Matrix Chain, and Longest Common Subsequence problems
- Be exposed to approximation algorithms for solving NP-hard problems.
- Be able to determine and measure the efficiency of a given algorithm, in practice, through different possible implementations, and by testing on suitable data sets.
- Be able to communicate clearly and precisely in writing about the theoretical analysis of an algorithm and its efficiency in practice

Materials:

We will be using *Introduction to Algorithms*, by Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest as our text.

Teaching Philosophy

The lecture is a supplement to the text, and not a replacement. Examinations will cover material presented in class as well as what is in the textbook. We do not have enough time to discuss everything in the textbook, so it is helpful if you ask questions in class when there is a topic you wish to discuss.

I will provide traditional PowerPoint lectures supplemented with demonstrations. I will try to have classroom exercises in addition to the written homework. If you miss a class, it is your responsibility to contact other students for notes/announcements you may have missed. Life happens, and missing an occasional class should not significantly affect your grade.

You are expected to spend at least 10 hours per week outside of class reading the text, working
on assignments, and working on the project. I realize that you have other commitments in your life, but you have made a commitment to this course by registering. I suggest that you start assignments early so that you have adequate time to ask questions.

**Computer Skills & Digital Literacy**

You are expected to have met the outcomes listed for all prerequisite courses listed earlier. The following additional skills are needed to succeed in this course.

- Using Canvas
- Using email with attachments
- Using the CSE machines, such as CSE01.
- Basic experience with the Unix operating system (may be acquired in the course).
- Using code repositories such as GitHub or GitLab.

**Grading:**

Late assignments are accepted at the rate of -20% credit for each day late unless accompanied by a university approved medical excuse.

Cheating will result in failure in the course. Please reference the UNT academic integrity policy for more information on cheating. Individual work such as homework assignments and quizzes must be done on your own. Do not discuss solutions or share copies of individual work.

**Technical Assistance**

We have a Student Help Desk that you can contact for help with Canvas or other technology issues. You are expected to have access to a computer in order to complete assignments and submit them. Note that you may checkout laptops at any UNT campus.

**UIT Help Desk:** [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm)

**Email:** helpdesk@unt.edu

**Phone:** 940-565-2324

**In Person:** Sage Hall, Room 130

**Walk-In Availability:** 8am-9pm

Telephone Availability:
- Sunday: noon-midnight
• Monday-Thursday: 8am-midnight
• Friday: 8am-8pm
• Saturday: 9am-5pm

**Laptop Checkout:** 8am-7pm

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328)

**Rules of Engagement**

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. Here are some general guidelines:

- While the freedom to express yourself is a fundamental human right, any communication that utilizes cruel and derogatory language on the basis of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law will not be tolerated.
- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Ask for and use the correct name and pronouns for your instructor and classmates.
- Speak from personal experiences. Use “I” statements to share thoughts and feelings. Try not to speak on behalf of groups or other individual’s experiences.
- Use your critical thinking skills to challenge other people’s ideas, instead of attacking individuals.
- Avoid using all caps while communicating digitally. This may be interpreted as “YELLING!”
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Avoid using “text-talk” unless explicitly permitted by your instructor.
- Proofread and fact-check your sources.
- Keep in mind that online posts can be permanent, so think first before you type.

See these [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) for more information.

**Course Requirements**

This is a tentative list of assignments. Percentages may change slightly.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points Possible</th>
<th>Percentage of Final Grade</th>
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</thead>
<tbody>
<tr>
<td>Homework assignments</td>
<td>100 points each</td>
<td>40%</td>
</tr>
<tr>
<td>1 Midterm Exam</td>
<td>100 points</td>
<td>20%</td>
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<tr>
<td>Term Project</td>
<td>100 points</td>
<td>15%</td>
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</tbody>
</table>
Class Participation | 100 points | 5%
Comprehensive Final Exam | 100 points | 20%

Assignments must be submitted on Canvas unless otherwise indicated. Unsolicited email submissions will not be accepted.

Grading
I guarantee that these percentages will be the maximum required for a letter grade. I usually lower these as needed to avoid having a large number of students on a grade boundary. Anyone I feel is on a boundary will receive the higher of the two grades.

A = 90% - 100%
B = 80% - 89%
C = 70% - 79%
D = 60% - 69%
F = 0% - 59%

If you believe that there is a mistake in the grading of one of your assignments, you must bring these inquiries to the professor within one week of when the assignment is returned. After this period, it is too late with the exception of an arithmetic error in calculating the score.

Attendance: Attendance and class participation are strongly encouraged, so plan to attend regularly. Students are responsible for any material and announcements covered in class. If you cannot attend, plan to get notes from a classmate.

Major Assignments:
Term Project
Midterm Exam
Final Exam (Comprehensive)

Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Readings</th>
<th>Due</th>
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<tbody>
<tr>
<td>19-January</td>
<td>Intro</td>
<td>Ch 1</td>
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<tr>
<td>24-January</td>
<td>Divide and Conquer / Sorting</td>
<td>Ch 2,3</td>
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<tr>
<td>26-January</td>
<td>Sorting</td>
<td></td>
<td></td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Chapters</td>
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<tr>
<td>31-January</td>
<td>Sorting</td>
<td>Ch 4,7,8</td>
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<tr>
<td>2-February</td>
<td>Sorting</td>
<td></td>
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<tr>
<td>7-February</td>
<td>Sorting</td>
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<td>9-February</td>
<td>Sorting</td>
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<td>14-February</td>
<td>Red-Black Trees</td>
<td>Ch 12,13</td>
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<tr>
<td>16-February</td>
<td>Red-Black Trees</td>
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<td>21-February</td>
<td>Red-Black Trees</td>
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<td>23-February</td>
<td>Red-Black Trees</td>
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<td>28-February</td>
<td>Midterm Exam</td>
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<td>2-March</td>
<td>Dynamic Programming</td>
<td>Ch 15</td>
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<td>7-March</td>
<td>Dynamic Programming</td>
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<td>9-March</td>
<td>Dynamic Programming</td>
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<td>21-March</td>
<td>Dynamic Programming</td>
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<tr>
<td>23-March</td>
<td>Dynamic Programming</td>
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<tr>
<td>28-March</td>
<td>Greedy Algorithms</td>
<td>Ch 16</td>
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<td>30-March</td>
<td>Graph Theory</td>
<td>Ch 22,23</td>
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<tr>
<td>4-April</td>
<td>Graph Theory</td>
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<td>6-April</td>
<td>Graph Theory</td>
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<td>11-April</td>
<td>Graph Theory</td>
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<tr>
<td>13-April</td>
<td>NP Complete</td>
<td>Ch 34,35</td>
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<tr>
<td>18-April</td>
<td>NP Complete</td>
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<tr>
<td>20-April</td>
<td>Approximation</td>
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<td>25-April</td>
<td>Linear/Integer</td>
<td>Ch 29</td>
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<tr>
<td>27-April</td>
<td>Linear/Integer</td>
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<tr>
<td>2-May</td>
<td>Strings</td>
<td>Ch 32</td>
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<td>4-May</td>
<td>Pre-Finals Review</td>
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<td>9-May</td>
<td>Comprehensive Final</td>
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**Course Evaluation**

Student Perceptions of Teaching (SPOT) is the student evaluation system for UNT and allows students the ability to confidentially provide constructive feedback to their instructor and department to improve the quality of student experiences in the course. When SPOT becomes available (generally in the last week or so of the course) you will receive an email. I offer a small amount of extra credit if class participation is over 80% of the students.
Course Policies
Class attendance is regarded as an obligation as well as a privilege. All students are therefore expected to attend each class meeting. A student who misses class is still responsible to find out what was discussed and to learn the material that was covered and obtain the homework that was assigned on the missed day. The instructor is not responsible for re-teaching material missed by a student who did not attend class. Therefore, each student is accountable for and will be evaluated on all material covered in this course, regardless of attendance.

Instructor Responsibilities and Feedback
As your instructor, I want you to succeed and graduate. This course covers important material, and UNT and ABET require each of you to demonstrate your competence with it. I try to provide clear instructions on the assignments, but you are encouraged to contact me if you are unsure about any aspect of an assignment. This is a good use of both of our time. I (and the TA’s) will answer questions about assignments, identify additional resources as necessary, provide grading rubrics when possible, as well as review and update course content.

The TA’s and I strive to get grades back within 1-1.5 weeks of submission. Grades and comments/feedback are provided in Canvas.

Syllabus Change Policy
The instructor reserves the right to change the course as needed, specifically (though not limited to) the case of topics, due dates, and assignments/assessment items. Any changes are done after careful consideration of the course objectives and student progress.

UNT Policies

Academic Integrity Policy
Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Policy
UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one’s specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for
every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website (https://disability.unt.edu/).

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)

The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Emergency Notification & Procedures
UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Retention of Student Records
Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year.
Students have the right to view their individual record; however, information about student’s records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University’s policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior
Student behavior that interferes with an instructor’s ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student’s conduct violated the Code of Student Conduct. The University’s expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT’s Code of Student Conduct (https://deanofstudents.unt.edu/conduct) to learn more.
Access to Information - Eagle Connect

Students’ access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student’s Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website (http://spot.unt.edu/) or email spot@unt.edu.

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT’s Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim’s compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565-2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Important Notice for F-1 Students taking Distance Education Courses

Federal Regulation

To read detailed Immigration and Customs Enforcement regulations for F-1 students taking online courses, please go to the Electronic Code of Federal Regulations website (http://www.ecfr.gov/). The specific portion concerning distance education courses is located at Title 8 CFR 214.2 Paragraph (f)(6)(i)(G).

The paragraph reads:
For F-1 students enrolled in classes for credit or classroom hours, no more than the equivalent of one class or three credits per session, term, semester, trimester, or quarter may be counted toward the full course of study requirement if the class is taken on-line or through distance education and does not require the student's physical attendance for classes, examination or other purposes integral to completion of the class. An on-line or distance education course is a course that is offered principally through the use of television, audio, or computer transmission including open broadcast, closed circuit, cable, microwave, or satellite, audio conferencing, or computer conferencing. If the F-1 student's course of study is in a language study program, no on-line or distance education classes may be considered to count toward a student's full course of study requirement.

University of North Texas Compliance

To comply with immigration regulations, an F-1 visa holder within the United States may need to engage in an on-campus experiential component for this course. This component (which must be approved in advance by the instructor) can include activities such as taking an on-campus exam, participating in an on-campus lecture or lab activity, or other on-campus experience integral to the completion of this course.

If such an on-campus activity is required, it is the student’s responsibility to do the following:

(1) Submit a written request to the instructor for an on-campus experiential component within one week of the start of the course.

(2) Ensure that the activity on campus takes place and the instructor documents it in writing with a notice sent to the International Student and Scholar Services Office. ISSS has a form available that you may use for this purpose.

Because the decision may have serious immigration consequences, if an F-1 student is unsure about his or her need to participate in an on-campus experiential component for this course, s/he should contact the UNT International Student and Scholar Services Office (telephone 940-565-2195 or email internationaladvising@unt.edu) to get clarification before the one-week deadline.

Student Verification

UNT takes measures to protect the integrity of educational credentials awarded to students enrolled in distance education courses by verifying student identity, protecting student privacy, and notifying students of any special meeting times/locations or additional charges associated with student identity verification in distance education courses.

See UNT Policy 07-002 Student Identity Verification, Privacy, and Notification and Distance Education Courses (https://policy.unt.edu/policy/07-002).
Use of Student Work

A student owns the copyright for all work (e.g. software, photographs, reports, presentations, and email postings) he or she creates within a class and the University is not entitled to use any student work without the student’s permission unless all of the following criteria are met:

- The work is used only once.
- The work is not used in its entirety.
- Use of the work does not affect any potential profits from the work.
- The student is not identified.
- The work is identified as student work.

If the use of the work does not meet all of the above criteria, then the University office or department using the work must obtain the student’s written permission.

Ask about the UNT System Permission, Waiver and Release Form

Transmission and Recording of Student Images in Electronically-Delivered Courses

1. No permission is needed from a student for his or her image or voice to be transmitted live via videoconference or streaming media, but all students should be informed when courses are to be conducted using either method of delivery.

2. In the event an instructor records student presentations, he or she must obtain permission from the student using a signed release in order to use the recording for future classes in accordance with the Use of Student-Created Work guidelines above.

3. Instructors who video-record their class lectures with the intention of re-using some or all of recordings for future class offerings must notify students on the course syllabus if students' images may appear on video. Instructors are also advised to provide accommodation for students who do not wish to appear in class recordings.

   Example: This course employs lecture capture technology to record class sessions. Students may occasionally appear on video. The lecture recordings will be available to you for study purposes and may also be reused in future course offerings.

No notification is needed if only audio and slide capture is used or if the video only records the instructor's image. However, the instructor is encouraged to let students know the recordings will be available to them for study purposes.

Class Recordings & Student Likenesses

Synchronous (live) sessions in this course will be recorded for students enrolled in this class section to refer to throughout the semester. Class recordings are the intellectual property of the university or instructor and are reserved for use only by students in this class and only for
educational purposes. Students may not post or otherwise share the recordings outside the class, or outside the Canvas Learning Management System, in any form. Failing to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

Mental Health
UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- Student Health and Wellness Center (https://studentaffairs.unt.edu/student-health-and-wellness-center)
- Counseling and Testing Services (https://studentaffairs.unt.edu/counseling-and-testing-services)
- UNT Care Team (https://studentaffairs.unt.edu/care)
- Individual Counseling (https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

Chosen Names
A chosen name is a name that a person goes by that may or may not match their legal name. If you have a chosen name that is different from your legal name and would like that to be used in class, please let the instructor know. Below is a list of resources for updating your chosen name at UNT.

- UNT Records
- UNT ID Card
- UNT Email Address
- Legal Name

*UNT euIDs cannot be changed at this time. The collaborating offices are working on a process to make this option accessible to UNT community members.

Pronouns
Pronouns (she/her, they/them, he/him, etc.) are a public way for people to address you, much like your name, and can be shared with a name when making an introduction, both virtually and in-person. Just as we ask and don’t assume someone’s name, we should also ask and not assume someone’s pronouns.

You can add your pronouns to your Canvas account so that they follow your name when posting to discussion boards, submitting assignments, etc.
Below is a list of additional resources regarding pronouns and their usage:

- What are pronouns and why are they important?
- How do I use pronouns?
- How do I share my pronouns?
- How do I ask for another person’s pronouns?
- How do I correct myself or others when the wrong pronoun is used?

Additional Student Support Services

- Registrar ([https://registrar.unt.edu/registration](https://registrar.unt.edu/registration))
- Financial Aid ([https://financialaid.unt.edu/](https://financialaid.unt.edu/))
- Student Legal Services ([https://studentaffairs.unt.edu/student-legal-services](https://studentaffairs.unt.edu/student-legal-services))
- Career Center ([https://studentaffairs.unt.edu/career-center](https://studentaffairs.unt.edu/career-center))
- Multicultural Center ([https://edo.unt.edu/multicultural-center](https://edo.unt.edu/multicultural-center))
- Counseling and Testing Services ([https://studentaffairs.unt.edu/counseling-and-testing-services](https://studentaffairs.unt.edu/counseling-and-testing-services))
- Pride Alliance ([https://edo.unt.edu/pridealliance](https://edo.unt.edu/pridealliance))
- UNT Food Pantry ([https://deanofstudents.unt.edu/resources/food-pantry](https://deanofstudents.unt.edu/resources/food-pantry))

Academic Support Services

- Academic Resource Center ([https://clear.unt.edu/canvas/student-resources](https://clear.unt.edu/canvas/student-resources))
- Academic Success Center ([https://success.unt.edu/asc](https://success.unt.edu/asc))
- UNT Libraries ([https://library.unt.edu/](https://library.unt.edu/))
- Writing Lab ([http://writingcenter.unt.edu/](http://writingcenter.unt.edu/))