NOTE: The information in this syllabus is subject to change if the university switches to remote instruction at any point during this semester.

Instructor: Dr. Margie Tieslau
Office: Wooten Hall 343
e-mail: Margie.Tieslau@unt.edu
Office Hours: Wednesdays, 2 PM to 5 PM, in person in Wooten Hall 343 and via Zoom at: https://unt.zoom.us/j/87365503961
Thursdays, 2 PM to 5 PM, in person in Wooten Hall 343 and via Zoom at: https://unt.zoom.us/j/84664464096
Office hours also available by appointment, at your request.

ZOOM LINK FOR LIVE CLASS SESSIONS:
Zoom link = https://unt.zoom.us/j/89663914738 ; meeting ID = 896 6391 4738

COURSE DESCRIPTION:
This course has two parts; the first part focuses on applied univariate and multivariate forecasting models and evaluating forecast accuracy, while the second part focuses on advanced theoretical time series topics. In addition, some attention is given to communicating and presenting results in a manner that can be understood by someone who is not an expert in the field. The class will focus on issues most commonly encountered in the fields of accounting, economics, and finance, with an emphasis on the following topics: stationary AR, MA and ARMA models; non-stationarity and tests for unit roots; ARCH and GARCH; vector autoregression and impulse response functions; and cointegration and error correction. The primary software package for empirical applications is the Statistical Analysis System (SAS).

COURSE PRE-REQUISITES:
The pre-requisites for this course are grades of "B" or better in ECON 5640 (Multivariate Regression Analysis) and ECON 5600. In particular, students are expected to have a solid background in: multiple regression; ideal conditions for OLS (the Gauss-Markov assumptions); correlation and covariance; t- and F-tests; significance levels; sums of squares & analysis of variance; matrix algebra; the concepts of unbiased, consistent & efficient; maximum likelihood estimation (including Wald, LM and LR tests), simultaneous equations estimation, probability limits; derivatives & partial derivatives; constrained & unconstrained optimization; difference equations; and infinite series.
TEXT:
The text for this course is *Applied Econometric Time Series* by Walter Enders, 4th edition (2014), published by Wiley. It also is acceptable to use the 3rd edition (2009) of this text. Be advised that many sections of this book are quite advanced and so you will not be expected to comprehend all material in the text. However, there are some sections in this text that may provide an excellent complement to the lecture material.

COURSE STRUCTURE:
Part of each class will be allocated to lecture, and part to computer lab work. You are required to work on material from the lecture during the lab period of class. In addition, you are expected to spend a considerable amount of time outside of class working in a computer lab.

GRADING:
Grades for the course will be based on the total points accumulated on three research projects and a final exam. The distribution of points is as follows:

<table>
<thead>
<tr>
<th></th>
<th>points possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasting Project #1</td>
<td>60</td>
</tr>
<tr>
<td>Midterm</td>
<td>100</td>
</tr>
<tr>
<td>Forecasting Project #2</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>120</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>380</strong></td>
</tr>
</tbody>
</table>

In order to earn a grade of "A" for the course, students must accumulate at least 90% of the total points available; to earn a grade of "B," students must accumulate 80% to 89% of the total points available.

*Forecasting Project #1:*
For this project, you will be given a time series variable that may or may not be stationary—you will have to determine that by applying unit root tests. After so doing, you will analyze the stationary version of your variable to find the best-fitting univariate model to explain that variable. You then will use that model to produce a forecast of the variable, and assess the accuracy of your forecast. And, of course, you will write up your findings as if presenting them to a group of non-experts. The project is due (as an email attachment, either a Word or pdf file) no later than 3 PM on February 25th. More details about this project will be supplied on February 11th.

*Midterm Exam:*
The midterm exam will take place in class on March 4th from 6:30 PM to 8:00 PM. It will cover topics 1 through 4. If you miss the midterm with a valid university-approved excuse (with appropriate documentation provided), you can transfer the weight of this exam to the final. The exam will be "closed book" and "closed notes," and a limited formula sheet will be provided.
Forecasting Project #2:

The structure of this project is nearly identical to that of “forecasting project #1” except that, for this project, you will devise your research question, you will find your data set (and clean it up if necessary), and you will consider a much larger collection of possible models to explain your chosen variable (for example, seasonal models). More specifically, you will collect your own time series variable, determine whether or not it is stationary, and find the best-fitting model to explain the stationary version of your variable. You will then use that model to produce a forecast of the variable, and assess the accuracy of your forecast. Then you will write up your findings as if presenting them to a group of non-experts.

You must submit a proposal for this paper, by email, no later than 3 PM on March 18th; if you do not meet this deadline, 10 points will be deducted from your score. If you would like to submit a “first round” version of this project (NOT a “rough draft”), it is due by email no later than 3 PM on April 8th. This is optional and not graded for credit, but if you do this, I will read your work, make suggestions for improvements (if improvements can be made), and return it to you by approximately April 15th so that you can improve the quality and content of your work. The final project is due by email no later than 3 PM on April 29th (the last Thursday of the semester). More details on this project will be given on March 4th, directly following the midterm exam (during the period from 8 PM to 9:20 PM).

Final Exam:

The final exam will be cumulative in nature and will take place on April 24th, from 1:30 PM to 3:30 PM in Gateway 141. This is because the Master’s graduation ceremony will take place on the Thursday of finals week (barring unforeseen events), and the university would like all Master’s students to be available to attend this ceremony. Those of you who are graduating SHOULD ATTEND this ceremony!

Except for those with official university-approved excuses (with appropriate documentation provided), everyone will be required to take the final exam at the scheduled time. The exam will be "closed book" and "closed notes," and a limited formula sheet will be provided.
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC OF DISCUSSION</th>
<th>READINGS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 14</td>
<td>Topic #1: Intro to Time Series Analysis &amp; SAS</td>
<td>Class handout</td>
</tr>
<tr>
<td>Jan. 21</td>
<td>Topic #2, Part 1: Inference on Stationary Univariate Time Series: AR, MA &amp; ARMA Models</td>
<td>Chapters 1 &amp; 2</td>
</tr>
<tr>
<td>Jan. 28</td>
<td>Topic #2, Part 2</td>
<td>Chapters 1 &amp; 2</td>
</tr>
<tr>
<td>Feb. 4</td>
<td>Topic #3, Part 1: Non-Stationarity and Tests for Unit Roots</td>
<td>Chapter 4, Unit Root Primer (article)</td>
</tr>
<tr>
<td>Feb. 11</td>
<td>Topic #3, Part 2</td>
<td>Chapter 4, Unit Root Primer (article)</td>
</tr>
<tr>
<td>Feb. 18</td>
<td>Topic #4: Seasonality</td>
<td>Chapter 2, section 11; Chapter 4, section 1; and pages 195 – 199</td>
</tr>
<tr>
<td>Feb. 25</td>
<td>Forecasting Project #1 due by 3 PM</td>
<td>Chapter 3</td>
</tr>
<tr>
<td></td>
<td>Topic #5, Part 1: Volatility and ARCH &amp; GARCH Models</td>
<td></td>
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<tr>
<td></td>
<td>Q &amp; A session for midterm</td>
<td></td>
</tr>
<tr>
<td>March 4</td>
<td>6:30 PM – 8 PM, MIDTERM EXAM</td>
<td>Topics 1 – 4</td>
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<tr>
<td></td>
<td>8 PM – 9:20 PM, Discuss details of forecasting project #2</td>
<td></td>
</tr>
<tr>
<td>March 11</td>
<td>Topic #5, Part 2: Stata and ARCH &amp; GARCH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Topic #6: Vector Autoregression and Impulse Response Functions</td>
<td></td>
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<tr>
<td>March 18</td>
<td>Project #2 proposals due by 3 PM</td>
<td>Chapter 6</td>
</tr>
<tr>
<td></td>
<td>Topic #7: Long-Run Relationships, Cointegration and Error Correction</td>
<td></td>
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<tr>
<td>March 25</td>
<td>Topic #8: The History of Time Series Analysis</td>
<td>Handouts</td>
</tr>
<tr>
<td></td>
<td>Topic #9: Reading Dated Data</td>
<td></td>
</tr>
<tr>
<td>April 1</td>
<td>Open lab period to work on research papers.</td>
<td></td>
</tr>
<tr>
<td>April 8</td>
<td>Optional: &quot;first round&quot; forecasting project #2 due by 3 PM</td>
<td></td>
</tr>
<tr>
<td>April 15</td>
<td>Open lab period to work on research papers.</td>
<td></td>
</tr>
<tr>
<td>April 22</td>
<td>Q &amp; A session for final exam.</td>
<td>Everything above</td>
</tr>
<tr>
<td>April 24</td>
<td>FINAL EXAM, 1:30 PM – 3:30 PM</td>
<td>Everything above</td>
</tr>
<tr>
<td>April 29</td>
<td>Forecasting project #2 due by 3 PM</td>
<td></td>
</tr>
</tbody>
</table>

*Readings refer to both the 3rd and 4th editions of the Enders text.*
SOFTWARE:
The software package used in this course is PC SAS, version 9.4 (or higher). **If you want to get the maximum benefit from this class, you should put a tremendous amount of effort into learning this software package!** Below are the hours and location of each of the general access labs supported by the College of Arts & Sciences.

Directions on how to use the lab remotely can be found at: [https://itservices.cas.unt.edu/covid-19/labs](https://itservices.cas.unt.edu/covid-19/labs).

**LOCATION AND HOURS OF OPERATION* OF CAS GENERAL ACCESS LABS:**

<table>
<thead>
<tr>
<th></th>
<th>GAB 330</th>
<th>GAB 550</th>
<th>Terrill 220</th>
<th>Wooten 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon - Th</td>
<td>8 AM – 10 PM</td>
<td>Closed</td>
<td>8 AM – 8 PM</td>
<td>8 AM – 6 PM</td>
</tr>
<tr>
<td>Friday</td>
<td>8 AM – 5 PM</td>
<td>Closed</td>
<td>8 AM – 5 PM</td>
<td>8 AM – 5 PM</td>
</tr>
<tr>
<td>Saturday</td>
<td>12 noon – 8 PM</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Sunday</td>
<td>12 noon – 8 PM</td>
<td>Closed</td>
<td>Closed</td>
<td>Closed</td>
</tr>
<tr>
<td>Exceptions</td>
<td>closed Jan. 18; closed April 24 &amp; 25</td>
<td>closed Jan. 18; closed April 24 &amp; 25</td>
<td>closed Jan. 18; closed April 24 &amp; 25</td>
<td></td>
</tr>
</tbody>
</table>

*Times and dates are subject to change without notice; please check the official schedule.

If, in the future, this class switches to “fully remote” or if you cannot attend lectures in person, it is critically important that you have personal access to SAS. Therefore, at your earliest possible convenience, please try to access SAS through “desktop streaming.” You should be able to do this either through a web browser or through the VMware Horizon Client. It might be easier and less cumbersome to use the VMware method since, by this method, you have a separate program for accessing the software, rather than working within a web browser. To do that, go to: [https://view.euc.untsystem.edu/portal/webclient/index.html#/](https://view.euc.untsystem.edu/portal/webclient/index.html#/). Detailed instructions on how to access “desktop streaming” (and “virtual lab”) are available at: [https://itservices.cas.unt.edu/services/computers/articles/access-desktop-streaming](https://itservices.cas.unt.edu/services/computers/articles/access-desktop-streaming). If you have any difficulty, please let me know so that we can work to get the problem straightened out.

If you are a student in the College of Business, or if you currently are enrolled in any class offered by the College of Business, you have access to SAS through their “virtual lab.” When running the SAS software, you will have a MUCH better experience if you use the “virtual lab” rather than “desktop streaming.” Instructions on how to do that also can be found at the link above.

Note that when working with SAS via desktop streaming, it only is possible to work with data, programs, or log files when the files are stored on a share drive (such as the H drive) or on OneDrive. SAS cannot work with files that are stored locally (on your laptop or desktop or home computer). Also, files saved in local directories will be lost upon logging off. This means that you must use your OneDrive account to save your work. This drive usually is mapped to the O: (oh) drive on the computer that you are using. In addition, SAS is a bit slow when using desktop streaming so be patient! It will work eventually, but it will take longer than you are accustomed to.

Information regarding OneDrive is available on Canvas, in the module for “Desktop Streaming.”
CLASS HANDOUTS:
On the first night of class, I will bring a copy of the lecture outline for you. After the first night, YOU will be responsible for bringing all of the handouts yourself. The plan is to make all handouts for a given Thursday night class available on Canvas by noon on the preceding Monday. Note: the handout that you should bring to class each night always is called something such as: "Lecture outline for topic XX.pdf," or "Lecture outline for topic XX part 1.pdf," or "Lecture outline for topic XX part 2.pdf," where XX refers to the topic number. **DO NOT PRINT ONCE CLASS BEGINS!**

ATTENDANCE POLICY:
On the first night of class, please choose your seat carefully as you will be required to sit in that seat for the entire semester. In addition, although you will not be graded on attendance, attendance will be taken every night and **class attendance is not optional.**

INTERNET RESOURCES:
Be forewarned: If you use the internet as a source to learn material for this class, you are strongly cautioned to do so at your own risk! There is a wealth of information on the internet that is NOT correct, even though it appears to be. If you collect information from sources other than refereed journal articles, that information might be incorrect and it might cost you points on graded assignments.

COMMUNICATION EXPECTATION:
If I need to contact you to convey class-related information, in keeping with University policy, I will use Canvas and your OFFICIAL UNT email address ONLY. Thus, it is YOUR responsibility to check your UNT email and the Canvas announcements for this class on a regular basis.

If you send an email to me, please only use your official UNT email account. In addition, I typically receive a large volume of emails each day so it might not be possible to respond to all emails right away. To maximize the probability that I will read and respond to your email in a timely manner, please: (1.) use the phrase "ECON 5645" in the subject heading; (2.) include your full name in the "from" line; (3.) sign your email using your full name.

**If you email me a question about your SAS work, please cut and paste the contents of your log window into a Word file and send that to me.**

CLASSROOM POLICIES:
Masks/face coverings are required at all times, and you must sit in your assigned seat throughout the duration of the semester. With the exception of your computer, keyboard & mouse, you are responsible for cleaning your seating area and workspace. Dr. T. will sanitize your computer, keyboard & mouse. During class, students are forbidden to have or use electronic devices such as tablets, cell phones, headphones, earphones, ear buds or the like (except in special cases where students have verified disabilities that require such devices).

A WORD OF WARNING ABOUT THIS CLASS CONVERTING TO REMOTE DELIVERY:
It is possible that this class will be converted into an on-line format at some point. If that happens, all lectures will be delivered at the normal class time via Zoom. Therefore, you must have access to a computer with a camera, microphone, and a quiet place to view the lecture. Information on how to be successful in a remote learning environment can be found at [https://online.unt.edu/learn](https://online.unt.edu/learn).
COVID-19 IMPACT ON ATTENDANCE:

While attendance is expected as outlined above, it is important for all of us to be mindful of the health and safety of everyone in our community in light of COVID-19, the flu, and other such conditions. Please contact Dr. T. if you are unable to attend class because you are ill, or unable to attend class due to an issue related to COVID-19, the flu, or other communicable diseases. It is important that you communicate your condition prior to being absent so a decision can be made regarding how best to accommodate your need to not be present in class.

If you are experiencing any symptoms of COVID-19 (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Hotline at 844-366-5892 or COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure. While attendance is an important part of succeeding in this class, your own health, and those of others in the community, is more important.

If Dr. T. gets sick or must self-isolate or self-quarantine at any point during the semester, lectures will be delivered at the normal class time via Zoom, and the plan is to have someone project the Zoom session onto the screen in our classroom in the Gateway Center. In that way, you still will be able to come to the classroom every Wednesday night, be with your classmates, use the computer equipment in the classroom, and have access to SAS.

A NOTE REGARDING CLASS RECORDINGS:

In the event that class recordings are made and distributed to you, these recordings are reserved exclusively for use of students in this class, and are to be used for educational purposes only. The recordings should not be shared outside the class in any form. Failure to follow this restriction is a violation of the UNT Code of Student Conduct and could lead to disciplinary action.

HOUSE RULES:

1. Masks/face coverings must be worn at all times and you must sit in your assigned seat.
2. No food or drink in the lab.
3. Turn off cell phones and all electronic devices during class time.
4. **DO NOT WORK ON YOUR COMPUTER DURING LECTURE.**
5. Question everything! Always ask "Why?" and "Does this make sense?" Be curious!
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 at disability.unt.edu.

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.

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. The Code of Student Conduct can be found at deanofstudents.unt.edu/conduct.

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: eagleconnect.unt.edu/
Technical Assistance:

At some point, it might be necessary for us to convert to remote delivery of this class. If that happens, here are some resources for you to help ease the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UNT 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: 8 AM to 9 PM
Telephone Availability:
- Sunday: noon to midnight
- Monday-Thursday: 8 AM to midnight
- Friday: 8 AM to 8 PM
- Saturday: 9 AM to 5 PM
Laptop Checkout: 8 AM to 7 PM
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 [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) for more information.
**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.

**Your Mental Health:**
Just as with your physical health, your mental health is VERY important to me. We are living in stressful and uncertain times. A great deal of attention has been paid, lately, to our physical health, but I want to remind you that there is help for our mental health too. UNT’s Student Health & Wellness Center, the Counseling Center, and the Care Team are staffed with many wonderful people who wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Please do not be afraid to reach to these caring professionals during this very difficult time; it really can help. DO NOT feel ashamed if you experience a crisis or if you are stressed out! Nearly everyone goes through some type of mental health issue at some point in their life—even the people who seem to be completely in control and who look totally “normal.” Begin with the links below:

- [Student Health & 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)
- [UNT Psychiatric Services](https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry)
- [Individual Counseling](https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

**Prohibition of Discrimination, Harassment & Retaliation:**
Consistent with 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.
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.