COURSE INFORMATION

Welcome to IPAC 4340. I am so excited to have you in class this semester and I look forward to working with all of you throughout the course.

- IPAC 4340: Methods for Discovery and Learning from Data
- Credit Hours: 3
- Coursera via Internet

Instructor Contact Information

- Dr. LeAnn K. Boyce
- Office Hours: Through Microsoft Booking: Mondays 3 pm – 4pm, Tuesdays 7 pm – 9 pm, and Fridays 10 am to Noon. Here is the link to make an appointment through Bookings: https://outlook.office365.com/owa/calendar/Education@myunt.onmicrosoft.com/bookings/s/AEo122UsAUqTYDXttvNpiw2
- Email: leann.boyce@unt.edu

Course Pre-requisites, Co-requisites, and/or Other Restrictions

Required prerequisite courses: NONE

Course Description

- 4340. Methods for Discovery and Learning from Data. 3 hours. Introduction to contemporary methods for discovery and learning from data sets. Emphasizes applications of predictive and pattern recognition techniques in deriving insights and making decisions in business and science contexts. Topics complemented by hands-on projects using data discovery and statistical learning software.
## Learning Objectives

<table>
<thead>
<tr>
<th>Module</th>
<th>Learning Objectives</th>
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</thead>
<tbody>
<tr>
<td><strong>Module 1</strong></td>
<td>Learn about Python, its history, and basic techniques used in Python</td>
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<tr>
<td><strong>Module 2</strong></td>
<td>Describe data quality, how to improve data quality and identify challenges of data quality and learn how to overcome those challenges Continue learning about Python and it’s data structures</td>
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<tr>
<td><strong>Module 3</strong></td>
<td>Continue to learn about Python and various data structures such as NumPy, DataFrames, and Tuples. Summarize Python’s libraries used throughout the course</td>
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<tr>
<td><strong>Module 5</strong></td>
<td>Discover and explain different EDA techniques and types Perform EDA in Python with hands-on assignment</td>
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<tr>
<td><strong>Module 6</strong></td>
<td>Summarize ML and AI history, uses, and processes Compare and contrast Supervised vs. Unsupervised ML methods Perform supervised machine learning with linear and logistic regression algorithms</td>
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<tr>
<td><strong>Module 7</strong></td>
<td>Summarize Unsupervised learning machine learning Perform unsupervised machine learning with the KMeans algorithm</td>
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</tbody>
</table>

## Course Topics

- Python Basics
- Data preprocessing
- Exploratory Data Analysis (EDA)
- Big data analytics and machine learning: Overview
• Big data analytics and machine learning: Supervised Linear Algorithms
• Big data analytics and machine learning: Unsupervised Algorithm
• Big data analytics and machine learning with NumPy, Pandas, Scikit-Learn in Python

Materials – Text, Readings, Supplementary Readings

No textbook is required for this course but we will have articles to read throughout the semester (these are listed in the weekly modules under content).

These books are NOT required but you might find them beneficial for extra reinforcement of the material.


Teaching Philosophy

I believe students must be given clear direction in order for them to succeed. It is important that they understand the course learning objectives as documented in the syllabus, and the deadlines for submission of all course work as documented on the course calendar. I have found that if a student understands the learning objectives and the contribution to their
professional development of each assignment, their quality of their work improves. I also believe that students need to be given timely feedback so that they know how to improve and to respond to communications from their professor in a timely manner. Timely feedback help students gain self-confidence and inspire them to fully engage in the course material and to believe that they can do well. It is important for students to know that as a professor, I understand that “life happens” and that I will be flexible when a legitimate problem arises. I also think that it is important to establish performance guidelines in the syllabus, and to establish a safe and welcoming learning community in each course. It is my responsibility as a teacher to get my students ready for the workforce and to ensure that they are prepared to meet the professional challenges ahead.

I look forward to a wonderful semester!

Course Requirements

1. The student will be responsible for checking the announcements in the UNT email and other types of class communication daily.

2. The student will access and follow all course instructions found in the syllabus, announcements, assignments, and all other class-related documents.

3. The student will complete all the class assignments in the time frame specified in the class documents, including the course calendar to participate effectively in-class activities.

4. The student will complete all the assessment tests and exams – if required – in the time frame specified in the class documents, including the course calendar.

5. The student will complete all the projects – if required – in the time frame specified in the class documents, including the course calendar.

Communication With Instructor

Interaction with Instructor: I look forward to getting to know all of you and working with you. Contact me anytime using my UNT email (Leann.Boyce@unt.edu). I will check the email daily and will make every effort to respond as quickly as possible. Please let me know in advance (8 hrs.) if you intend to have an online meeting. Here is a great website provided by CLEAR to give you some communication tips for communicating online: CLEAR has a webpage for students that provides Online Communication Tips.
Technical Requirements/Assistance
UNT Help Desk: [http://www.unt.edu/helpdesk/index.htm](http://www.unt.edu/helpdesk/index.htm)

The University of North Texas provides student technical support in the use of Canvas and supported resources. The student help desk may be reached at:

Email: helpdesk@unt.edu
Phone: 940.565-2324
In Person: Sage Hall, Room 130
Hours are:
- Monday-Thursday 8am-midnight
- Friday 8am-8pm
- Saturday 9am-5p
- Sunday 8am-midnight
- Other related hardware or software necessary for the course: such as headset/microphone for synchronous chats, word processor, etc.
- Canvas technical requirements: [https://clear.unt.edu/supported-technologies/canvas/requirements](https://clear.unt.edu/supported-technologies/canvas/requirements)
- Other related hardware or software necessary for the course: such as headset/microphone for synchronous chats, word processor, etc.

Success in the Online Course
While the online classroom shares many similarities with the face-to-face classroom, success in online education requires certain skills and expectations that students may not be aware of. Here is a link to check out if you have not taken an online course in the past, “[How to Succeed as an Online Student.](#)"

Student Academic Support Services
- **Code of Student Conduct**: provides Code of Student Conduct along with other useful links
- **Office of Disability Access**: exists to prevent discrimination based on disability and to help students reach a higher level of independence
- **Counseling and Testing Services**: provides counseling services to the UNT community, as well as testing services, such as admissions testing, computer-based testing, career testing, and other tests
- **UNT Libraries**
- **UNT Learning Center**: provides a variety of services, including tutoring, to enhance the student academic experience
Assessment & Grading

There are twelve Python exercises throughout the course. These assignments are a complete only grade. Once complete, you will receive 25 points for the completed work. Please note: All code blocks must be run and assignments must be submitted in time to receive full credit.

- Students are required to submit their homework on time to receive full credit.

There are 3 quizzes over the twelve Python exercises.

- Students are required to submit their homework on time to receive full credit.

There are 4 graded assignments in machine learning in the second half of the course.

- Students are required to submit their homework on time.

There will be one midterm take-home exam.

- Midterm take-home exam is assigned and due in Week 4. You have a week to complete the midterm.
- The midterm is given in 2 parts: Part A is theory-based and Part B is based on the Python exercises completed in the first half of the course and will be completed in Jupyter Notebook. Please see the video on the Mid-Term, Part B to help you navigate through this section.
- Students are required to submit their midterm on time. There are NO late submission accepted on the midterm.

There will be a final take-home exam.

- Just as in the midterm, the Final has 2 parts: Part 1 will be on one selected algorithm and Part 2 will be on another selected algorithm. Both Part 1 & 2 will be completed in Jupyter Notebook.
- Students are required to submit their final on time. There are NO late submission accepted on the final.

Make-Up Policy

No make-up assignment or exams will be offered except for being approved in advance. Students will be required to provide necessary documentation.
Late-work Policy
All assignments are to be submitted by the due date and time.

The deadline for submitting an assignment is 11:59 PM on the due date.

You are allowed one late assignment, without penalty. Please choose the one assignment wisely. After the one late submission, the subsequent assignments will incur a 25% deduction for each day thereafter.

NOTES: Late work is subject to the penalty described above unless previously approved by the instructor.

Class Schedule

The following is a tentative schedule. Should any change become necessary, it will be announced via the UNT email. It is the student’s responsibility to check for changes in the schedule.

<table>
<thead>
<tr>
<th>Module</th>
<th>Date</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug. 23rd – Aug. 29th</td>
<td>Lectures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Python Introduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Big Data, AI, &amp; Machine Learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Homework:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fundamentals of Programming in Python</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Basic Techniques of Programming Part 1 in Python</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Basic Techniques of Programming Part 2 in Python</td>
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<tr>
<td></td>
<td></td>
<td>• Built-in Basic Data Types</td>
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<tr>
<td></td>
<td></td>
<td>Readings:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="https://doi.org/10.1016/j.bushor.2019.02.001">https://doi.org/10.1016/j.bushor.2019.02.001</a></td>
</tr>
<tr>
<td>2</td>
<td>Aug. 30th – Sept. 5th</td>
<td>Lectures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Data Quality</td>
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</tbody>
</table>
## Homework:
- Formatting Output in Python
- Python Data Structures: Lists
- Python Data Structures: Range
- Python Data Structures: Strings

## Readings:

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lectures</th>
<th>Homework</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Sept. 13&lt;sup&gt;th&lt;/sup&gt; – Sept. 19&lt;sup&gt;th&lt;/sup&gt;</td>
<td><strong>MIDTERM</strong></td>
<td></td>
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<tr>
<td>5</td>
<td>Sept. 20&lt;sup&gt;th&lt;/sup&gt; – Sept. 26&lt;sup&gt;th&lt;/sup&gt;</td>
<td>Exploratory Data Analysis, Data Visualization</td>
<td><strong>Homework:</strong> No work is due but you can start working on the Data Visualization Homework that is due next week.</td>
<td>Martinez, O., Martinez, C., Parra, C., Rugeles, S., Suarez, D. (2021). Machine</td>
</tr>
<tr>
<td>Week</td>
<td>Dates</td>
<td>Lectures</td>
<td>Homework</td>
<td>Readings</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
| 6    | Sept. 27<sup>th</sup> – Oct. 3<sup>rd</sup> | ML Supervised Learning: Linear Regression  
| 7    | Oct. 4<sup>th</sup> - Oct. 10<sup>th</sup> | ML Unsupervised Learning: KMeans | Homework Assignment – Kmeans | Georgescu, I., kinnunen, J. Androniceanu, A.  
| 8    | Oct. 11<sup>th</sup> – Oct. 15<sup>th</sup> | **FINAL** | | |
### Assignment Points

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points Possible</th>
<th>Percentage of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Python Exercises</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 @ 25 points ea.</td>
<td>300 points</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Quizzes over Python Exercises</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 @ 50 points each</td>
<td>150 points</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Midterm</strong></td>
<td>201 points</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Final</strong></td>
<td>200 points</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Machine Learning Hands-on assignments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Data Visualization @ 100 points</td>
<td>400 points</td>
<td>25%</td>
</tr>
<tr>
<td>• Linear Regression @ 100 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Logistic Regression @ 100 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• KMeans @ 100 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Points Possible</strong></td>
<td>1251 points</td>
<td>100%</td>
</tr>
</tbody>
</table>

The final letter grade will be determined as follows:

- A: 90 – 100
- B: 80 – 89
- C: 65 – 79
- D: 50 – 64
- F: < 50

### Course Evaluation

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 October 4th – October 14th 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" (noreply@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.
Course Policies

Online Assignments and Examinations Policy
The University is committed to providing a reliable online course system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will extend the time windows and provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and contact the UNT Student Help Desk: helpdesk@unt.edu or 940.565.2324. The instructor and the UNT Student Help Desk will work with the student to resolve any issues at the earliest possible time.

Instructor Responsibilities and Feedback
The instructor is responsible for responding to student questions about assignments and projects, about the course material presented, and for providing additional resources to enhance understanding of course material. Timely feedback is essential for student success and the instructor is responsible for providing timely feedback to students throughout the course. The instructor or TA will grade submitted assignments and will post grades for students within 10 days of assignment due date.

Attendance Policy
Student Responsibility. The student is responsible for regular and punctual attendance and is expected to participate in all courses in which the student is enrolled. For online classes, this means regular log-in to Canvas. It is the responsibility of the student to check for announcements daily in an online class. For more information, please see the University of North Texas’ Attendance Policy at: http://policy.unt.edu/policy/15-2-5

Class Participation
Attendance is expected for this class. Students are required to log in regularly to the online class site. Students are also required to participate in all class activities. To learn more about campus resources and information on how you can achieve success, go to https://succeed.unt.edu.

COVID-19 Impact on Attendance

Face Coverings
UNT encourages everyone to wear a face covering when indoors, regardless of vaccination status, to protect yourself and others from COVID infection, as recommended by current CDC guidelines. Face covering guidelines could change based on community health conditions.

**Attendance** - (Since this is an online class, this does not pertain to this class.) Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

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 Team at COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure.

**Course Materials for Remote Instruction**
Remote instruction may be necessary if community health conditions change or you need to self-isolate or quarantine due to COVID-19. Students will need access to a webcam and microphone to participate in fully remote portions of the class. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn

**Syllabus Change Policy**
Changes to the course syllabus or due dates are not anticipated but should they be necessary, the instructor will provide ample notification to students to allow them to complete assignments in a timely manner without penalty.

**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.

All works submitted for credit must be original works created by the scholar uniquely for the class. It is considered inappropriate and unethical to make duplicate submissions of a single
work for credit in multiple classes, unless specifically requested by the instructor. Students must submit their own work. It is unacceptable to copy work from another student or copy and paste from a website.

**PLEASE NOTE**: “Plagiarism is a very serious offense at UNT. Even if you don’t mean to plagiarize, you can still commit academic dishonesty. When you are accepted to UNT, you are expected to adhere to our policies and standards of Academic Integrity (as defined in University 07.012) in the Code of Student Conduct. Major violations can result in expulsion from the university. “Please see [https://guides.library.unt.edu/plagiarism/atunt#:~:text=Plagiarism%20is%20a%20very%20serious%20offense%20at%20UNT.&text=When%20you%20are%20accepted%20to,in%20expulsion%20from%20the%20university](https://guides.library.unt.edu/plagiarism/atunt#:~:text=Plagiarism%20is%20a%20very%20serious%20offense%20at%20UNT.&text=When%20you%20are%20accepted%20to,in%20expulsion%20from%20the%20university) for more information on plagiarism.

**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](http://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 Blackboard 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 Blackboard 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. The Code of Student Conduct can be found at [deanofstudents.unt.edu/conduct](http://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](http://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/](http://eagleconnect.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](mailto: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](mailto:oeo@unt.edu) or at (940) 565 2759.

**Important Notice for F-1 Students taking Distance Education Courses**

**Federal Regulation**

The paragraph reads:
(G) 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](#).

**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.

Download 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 presentation, 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.