A. COURSE INFORMATION

Course number/section: PHYS 4340
Class meeting time: MWF 1-2pm
Class locations: CCH-252, TTVN Video Classroom
                 CI-217, Physics Laboratory
Course Website: http://wtclass.wtamu.edu/

B. INSTRUCTOR INFORMATION

Instructor: Dr. Cathy Clewett
Office location: West Texas A&M University
Office hours: MWF 9-10, TR 3-4
Telephone: 806-651-2545
e-mail: cclewett@wtamu.edu
Appointments: Email for appointments.

Local Facilitator: Dr. Jeff Spirko
Office location: NRC-1111 (inside NRC-1100)
Office hours: MT 10-12, R 1-2, Live Calendar: http://tinyurl.com/spirkocal
Telephone: 361-825-6020
e-mail: jeffery.spirko@tamucc.edu (preferred over phone calls)
Appointments: Email for appointments. Check Live Calendar and suggest an open time.

C. COURSE DESCRIPTION

Catalog Course Description
A laboratory course focusing on experimental design, advanced data analysis and reduction, and experimental laboratory techniques and instrumentation. Experiments will be drawn from a variety of physics areas.

Extended Course Description

This course is being offered by the Texas Physics Consortium as part of the Joint BS degree with a Physics Major. All TPC courses use the WTClass system for class management (instead of Blackboard). For more information on TPC, please visit our website (http://www.tarleton.edu/tpc/) or speak with the Local Facilitator.

The Course Syllabus from the sending institution is attached and is the primary Syllabus that the instructor will follow. This Syllabus exists to make sure you have all of the information summarized in one place and that you are informed about TAMUCC policies.
D. **PREREQUISITES AND COREQUISITES**

Prerequisites
- PHYS 3334 – Modern Physics I

E. **REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES**

Required Textbook(s)
- John Taylor An Introduction to Error Analysis, 2nd Ed. ISBN 978-0-935702-75-0

Supplies
- Internet access is vital for interacting with the instructor and the local facilitator.
- Access to a scanner may be required to submit homework assignments. The Local Facilitator can help with this.

F. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

Specific learning objectives will be shared by the instructor in the Syllabus and during Class.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**

Classes will be held via live a video conference among all of the Texas Physics Consortium schools. Students will be able to ask questions during class, and the instructor will see who is asking the question.

Lab sessions will be held in CI-217A on Fridays. Expect labs to take longer than the 1 hour. The additional time is flexible.

H. **MAJOR COURSE REQUIREMENTS AND GRADING**

Course requirements and grading will be discussed by the instructor during the first class.

The Advanced Physics Lab requires performing several physics experiments outside of class time. These can be done in the physics laboratory on Fridays with the help of Dr. Spirko.

I. **COURSE CONTENT/SCHEDULE**

The expected content and schedule will be distributed by the instructor during the first class.
Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

The course instructor will discuss specific course policies during the first class.

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- Statement of Civility
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must submitted. No student is eligible to receive a W without completing the official
drop process by this deadline. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. 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 an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

  http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.
L. OTHER INFORMATION

- The Local Facilitator is happy to help with physics questions and with administrative matters, but you, the student, are responsible for keeping track of assignments and exams. Don’t assume that the Local Facilitator knows when your exams are taking place. Keep in touch; let us know when things are happening. Proctoring takes at least a few days to arrange, so make sure things are ready and confirmed **BEFORE** your exam takes place.
- The Course Syllabus from the sending institution is attached and is the primary Syllabus that the instructor will follow.

GENERAL DISCLAIMER

We reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. We will announce such changes in a timely manner during regularly scheduled lecture periods and on the course website.
Syllabus
Advanced Physics Lab WT PHYS 3350
Dr. Cathy Clewett
Spring 2015

Contact Information and Office Hours –
Instructor: Dr. Cathy Clewett
Email: cclewett@wtamu.edu
Office: ANS 114 G
Office Phone: 806.651.2545
Office Hours: M-F 9:00-10:00 am; TTH 3:00 -4:00 pm; by appointment, or just stop in (call).

Texts and Other Materials –
Required Texts: John Taylor An Introduction to Error Analysis, 2nd Ed.
ISBN 978-0-935702-75-0
Other Required Materials: Scientific Calculator, Laboratory Notebook, access to computer software for document presentation and graphing, and access to WTClass.

Course Description –
A laboratory course focusing on advanced techniques and experiments drawn from the full range of physics classes. The student will understand the role of experimental design, advanced data analysis and reduction, error analysis, and the use of computers while investigating physical phenomena.
Hours: 3 credit hours (1 lecture/4 Lab)
Pre-requisites: Modern Physics (co-requisite)

Objectives/Student Learning Outcomes –
The students in this course will:

- Communicate physics topics to others effectively orally and in writing
- Demonstrate effective research skills
- Display critical thinking skills in applying their knowledge to realistic problems and situations.

Upon successful completion of the course, the student will have learned to use a laboratory logbook, done a literature search of information on modern physics experiments, and had experience in using computers in both experimental control and data analysis. The student will have a good understanding of the inclusion of
experimental statistical and systematic uncertainty (error analysis) into data analysis and had experience in writing up experiments following publication guidelines. These objectives will be accomplished by the students through completion of 6 experiments. Although the experiments may vary slightly from school to school, they will have the same objectives.

Program Learning Outcomes –
Program outcomes related to this course:

- Communicate physics topics to others effectively orally and in writing.
- Use appropriate mathematical techniques in solving advanced physics problems.
- Display critical thinking skills in applying their knowledge to realistic problems and situations
- Demonstrate adequate core knowledge in physics topics.

Course Requirements and Evaluation –
This class requires a considerable amount of time outside of class in the lab, at the computer, and in the library. This is a practice-intensive course: the major portion of your grade is from labs, an oral presentation, homework, and your group’s perception of in-lab activities. Information will be listed on the webpage prior to discussion in class.

Group work: It is expected that you will work with a group of 2-3 members throughout the semester. This requires you to meet with that group outside of class time in order to discuss readings, problems, and concepts. It is expected that you discuss problem sets together, but that you individually work the problem for any assignment that is given unless specifically told otherwise. Tests and quizzes will be taken individually. For students taking the class via TTVN, feel free to talk with faculty members at your institution if you have questions, or contact me directly.

Formal Laboratory reports (6 x 12%) are the majority of the grade in this class. Portions of the reports may be group write-ups, while other portions will be on an individual basis. Each student will receive a grade based on the work demonstrated and corroborated by their peers. Work will be graded on accuracy and scientific merit as well as clarity of expression and following of proper form. Lab reports must be turned in at the assigned time to receive credit. There will be no exceptions. Information about the method of turning homework in will be discussed on the first day of class.

Oral reports (15%) Each group will make at least one oral presentation during the semester. If there is time, more opportunities will be made available. On an individual basis, students will be judged on their presentation skills, so it is imperative that each student takes an active role. More details will follow.

Reading/ Participation/ Ancillary Assignments (13%) Periodically, additional assignments will be made in class in regards to data analysis, research skills, and/or critical thinking skills. Demonstration of reading through asking questions and participating in class and effectively communicating with the professor (both in and out
of class) will be weighed in to the grade. Students will also be asked to evaluate their own, and the work of their team mates for each laboratory report.

**Evaluation**

<table>
<thead>
<tr>
<th>Formal Laboratory Reports</th>
<th>72%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral reports</td>
<td>15%</td>
</tr>
<tr>
<td>Reading/Participation/HW</td>
<td>13%</td>
</tr>
</tbody>
</table>

Class attendance and classroom participation are subjectively weighted into the final grade. The final letter grade for the course will be based on the grading scale:

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

Please note that an incomplete will be awarded only in extreme cases. Like any course, you must make time to do the work required for success.

**Policies and Responsibilities –**

- **Communication:** Email (and WTClass if possible) is the primary means of communication in this class. WTClass and email notifications are official and equivalent to those made in class. It is your responsibility to check the email given to the instructor daily. Likewise, you can contact me via WTClass, email (cclewett@wtamu.edu) or phone (806.651.2545), or via Skype (cathy.clewett) if necessary.

- **Professor Responsibilities:** As a professor of a distance education class, it is my responsibility to respond to student questions in a reasonable amount of time. As such, students can expect a return of telephone messages or emails within 24 hours during the class week (M-F) and 48 hours on weekends or holidays. Student can expect to receive graded work within one week of submission. Students may also be provided with solutions to homework sets at least one class period prior to tests or exams. Students may contact me via their registered email at any time to find out their progress in class or visit with me in person.

- **Attendance Policy:** Grades for homework, in-class exercises, and lab grades are only given if the student attends class. Attendance will be taken, and you will be notified if you are not attending class regularly. Please contact me via email (cclewett@wtamu.edu) or phone (806.651.2545) prior to class if you must miss a class period.

- **Late Work Policy:** Late work will not be accepted. It must be turned in at the time assigned. If an actual emergency prevents you from attending class, I reserve the right to accept homework if I have been notified of the emergency in a timely fashion.
• **Due Dates in General**: I will try to stick to the posted schedule as closely as possible. If it must be changed, I will notify students on WTClass. Students have a responsibility to follow the schedule and be prepared for class.

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**Academic Integrity**

All work must be completed individually unless otherwise stated. Commission of any of the following acts shall constitute scholastic dishonesty: acquiring or providing information for any assigned work or examination from any unauthorized source; informing any person or persons of the contents of any examination prior to the time the exam is given in any subsequent sections of the course or as a makeup; plagiarism; submission of a paper or project that is substantially the same for two courses unless expressly authorized by the instructor to do so. For more information, see the [Code of Student Life](http://www.wtamu.edu/webres/File/Student%20Life/Web-2012-2013-Code-of-Student-Life.pdf) or the equivalent for your home institution.

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**Acceptable Student Behavior**

Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program ([Code of Student Life](http://www.wtamu.edu/student-support/disability-services.aspx)). Unacceptable or disruptive behavior will not be tolerated. Students engaging in unacceptable behavior may be instructed to leave the classroom. Inappropriate behavior may result in disciplinary action or referral to the University’s Behavioral Intervention Team. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc.

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**ADA Statement**

West Texas A&M University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student’s responsibility to register with [Student Disability Services](http://www.wtamu.edu/student-support/disability-services.aspx) (SDS) and to contact faculty members in a timely fashion to arrange for suitable accommodations. Contact Information: Student Success Center, CC 106; phone (806) 651-2335.

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**Evacuation Statement**

If you receive notice to evacuate the building, please evacuate promptly but in an orderly manner. Evacuation routes are posted in various locations indicating all exits, outside assembly area, location of fire extinguishers, fire alarm pull stations and...
emergency telephone numbers (651-5000 or 911). In the event an evacuation is necessary: evacuate immediately do not use elevators; take all personal belongings with you; report to outside assembly area and wait for further information; students needing assistance in the evacuation process should bring this to the attention of the instructor at the beginning of the semester.

**Chemical and Equipment Safety Statement** –

Safety is everyone’s responsibility. Material Safety Data Sheets (MSDSs) are provided for all chemicals used in this class. MSDSs provide information about physical properties, health risks, fire explosion data, and other important information associated with these chemicals. Before handling or using a chemical, you should refer to the MSDS for that chemical. It is your responsibility to inform the instructor in writing of any health conditions that may prevent you from safely using a chemical (pregnancy, auto immune deficiency, etc.). It is also the responsibility of the student to report any spill or problems found while storing or using a chemical. If you are unsure about a chemical, always ask. If you see any unsafe condition, notify your instructor immediately. If you are unsure about the proper and safe operation of any piece of equipment, ask your instructor for proper instruction. All injuries, spill of materials and unsafe conditions must be reported to the instructor immediately.

Any pregnant students, or students planning to become pregnant, should consult their health care provider to determine what, if any, additional precautions are needed based on their individual situation. It is the responsibility of the student to communicate their needs to the Vice President for Student Affairs as soon as possible in order for risk-reduction to begin when it can be most effective, and to determine if additional modifications are necessary. While the university cannot mandate that the student notify that she is pregnant or is planning to become pregnant, the university strongly recommends that students provide notification so appropriate steps can be taken to ensure the health of both parent and child. To communicate health circumstances or to request additional information, please contact the Vice President for Student Affairs.

**Student Laboratory Safety Training**

An online Student Laboratory Safety Training may be required and assigned through WTClass upon registration for this class. By registering for this class, the student agrees to complete the assigned training (if needed), no later than 12th class day for fall/spring terms or 5th class day for summer terms and acknowledge non-participation in activities if not completed by 18th class day for fall/spring terms; 10th class day for summer terms. The requirements for student laboratory safety will be determined on each campus.

**Copyright Statement** –

Copyright 2014 Catherine F. Clewett as to this syllabus and all instructional material; materials may not be reproduced without Catherine Clewett’s written consent. Students are prohibited from selling (or being paid for taking) notes during this course to or by any person or commercial firm without the express written permission of Catherine Clewett.
## Tentative Calendar of Readings, Topics

<table>
<thead>
<tr>
<th>Week/Day</th>
<th>Date</th>
<th>Chapter</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tue</strong></td>
<td>20-Jan</td>
<td>CH 1-3 Error Analysis, Uncertainty, Propagation</td>
<td>Graphing and fitting data, learning the details of writing a scientific paper.</td>
</tr>
<tr>
<td>1 Th</td>
<td>22-Jan</td>
<td>Physics Review Template</td>
<td>Data Analysis</td>
</tr>
<tr>
<td><strong>Tue</strong></td>
<td>27-Jan</td>
<td>Typesetting equations</td>
<td></td>
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<tr>
<td>2 Th</td>
<td>29-Jan</td>
<td>Scientific graphs/figures</td>
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<tr>
<td><strong>Tue</strong></td>
<td>27-Jan</td>
<td>CH 4-5 Statistical Analysis of Random</td>
<td>Particle Detector</td>
</tr>
<tr>
<td>3 Th</td>
<td>29-Jan</td>
<td>Uncertainty, Normal distribution</td>
<td>Particale detector/Geiger counter. Design the experiment for best detection, using experimental statistical and systematic uncertainty in the data analysis.</td>
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<tr>
<td><strong>Tue</strong></td>
<td>3-Feb</td>
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<tr>
<td>4 Th</td>
<td>5-Feb</td>
<td></td>
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<tr>
<td><strong>Tue</strong></td>
<td>10-Feb</td>
<td>CH 6-7 Rejection of Data, Weighted Averages</td>
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<tr>
<td>5 Th</td>
<td>12-Feb</td>
<td>X-ray and Electron diffraction</td>
<td>This experiment uses either X-ray or Electron diffraction to demonstrate the wave characteristics of particles. In this and other experiments, a literature search for background information and recent progress will be required.</td>
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<tr>
<td><strong>Tue</strong></td>
<td>17-Feb</td>
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<tr>
<td>6 Th</td>
<td>19-Feb</td>
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<td></td>
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<tr>
<td><strong>Tue</strong></td>
<td>24-Feb</td>
<td>CH 8-9 Least Squares, Covariance and Correlations</td>
<td>Measurement of g</td>
</tr>
<tr>
<td>7 Th</td>
<td>26-Feb</td>
<td></td>
<td>Students will use laboratory apparatus to measure this derived constant. Students will continue practicing writing experiments using publication guidelines.</td>
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<tr>
<td><strong>Tue</strong></td>
<td>3-Mar</td>
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<td>8 Th</td>
<td>5-Mar</td>
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<tr>
<td><strong>Tue</strong></td>
<td>10-Mar</td>
<td>CH 10 The Binomial Distribution</td>
<td>Measurement of G</td>
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<tr>
<td>9 Th</td>
<td>12-Mar</td>
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<td>Students will use laboratory apparatus to measure this fundamental constant and discuss the level of precision. Both error analysis and writing skills will be assessed.</td>
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<tr>
<td><strong>Tue</strong></td>
<td>17-Mar</td>
<td>WTAMU is Closed</td>
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<tr>
<td>10 Th</td>
<td>19-Mar</td>
<td>WTAMU is Closed</td>
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<tr>
<td><strong>Tue</strong></td>
<td>24-Mar</td>
<td>CH 11 The Poisson Distribution</td>
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<tr>
<td>11 Th</td>
<td>26-Mar</td>
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<tr>
<td><strong>Tue</strong></td>
<td>31-Mar</td>
<td>CH 12 Chi-Squared Test for a distribution</td>
<td>Measurements with NMR/Observational Astronomy</td>
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<tr>
<td>12 Th</td>
<td>2-Apr</td>
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<td>In this laboratory, students will use computers to collect and analyze data from Nuclear Magnetic Resonance experiments located at the schools or computer controlled telescopes available at Tarleton. This experiment will allow students to practice with a modern experimental technique frequently used in research labs and other settings.</td>
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<td><strong>Tue</strong></td>
<td>7-Apr</td>
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<td>13 Th</td>
<td>9-Apr</td>
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<td>14-Apr</td>
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<td>16-Apr</td>
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<td>23-Apr</td>
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<td>16 Th</td>
<td>30-Apr</td>
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<td>5-May</td>
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<tr>
<td>Th</td>
<td>7-May</td>
<td>Dead Day no classes</td>
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</tbody>
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* Last Day to Drop 3/31 at WT, other institutions check calendars