Texas A&M University - Corpus Christi  
College of Science and Engineering  
Department of Physical and Environmental Sciences

Course Syllabus

ESCI 4490: Severe weather; CMSS 5960: High impact weather systems

INSTRUCTOR:

Dr. Chuntao Liu  
Email: chuntao.liu@tamucc.edu  
Office: NRC 3510  
Phone: 361-825-3845  
Office hour: MW 9:00-11:00AM

CLASS MEETING:

Tuesday and Thursday, 9:30AM-10:45AM, BH127

TEXTBOOKS:

Class Textbook, Required:

No requirement

Secondary Class References (not required):

Mesoscale Meteorology and forecasting -by Peter S. Ray, 1986  
Mesoscale Meteorology in Midlatitudes –by Paul Markowski and Yvetter Richardson, 2010  
Textbook website: http://severewx.atmos.uiuc.edu

I. COURSE DESCRIPTION

This course focuses on introducing mesoscale weather systems including thunderstorms, squall lines and hurricanes, as well as the mechanisms of tornado and lightning. The methods of observing, analyzing, and predicting these severe weather systems with the interpretation of satellite and radar images will also be introduced in this class.

II. COURSE AUDIENCE

The course is open to a broad audience of undergraduate and graduate students in the College of Science and Engineering, who are interested in understanding the mechanism of severe weather and gain the basic knowledge of interpreting the weather radar and satellite images. Primary audience will be the undergraduate students in programs with background of math and physics, such as Environmental Sciences, and Marine Biology. The prerequisite is ESCI3403.

III. LEARNING OUTCOMES

At the conclusion of this course the student should be able to:

1. Understand the mechanisms of the mesoscale weather systems, including super cells, squall lines, and hurricanes, as well as the physics behind tornados and lightning.
2. Understand the fundamental principle of weather radar remote sensing and how to interpret the weather radar and satellite images for severe weathers.
3. Communicate the research in a professional and effective manner

IV. COURSE TOPICS

Historical review of severe weather and introduction of atmosphere, weather maps, weather radar and satellite remote sensing, and mechanisms of severe weathers, including thunderstorms, squall lines, hurricanes, tornados, lightning and aviation and mountain related severe weathers.

V. INSTRUCTIONAL METHODS AND ACTIVITIES

Traditional lectures via board demonstrations and power point presentations, classroom discussions, and student homework, reading, and projects. Homework will consist of assigned readings and critical analysis.

VI. EVALUATION AND GRADE ASSIGNMENT

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Overall Grade Percentage</th>
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<tbody>
<tr>
<td>Class Participation</td>
<td>5%</td>
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<tr>
<td>Homework</td>
<td>30%</td>
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<tr>
<td>Mid-term Exam</td>
<td>35%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
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<tr>
<td>Total:</td>
<td>100%</td>
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<table>
<thead>
<tr>
<th>Class Average (X)</th>
<th>Grade</th>
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<tbody>
<tr>
<td>X ≥ 90.0%</td>
<td>A – Excellent</td>
</tr>
<tr>
<td>89.9% ≤ X &lt; 80.0%</td>
<td>B – Good</td>
</tr>
<tr>
<td>79.9% ≤ X &lt; 70.0%</td>
<td>C – Satisfactory</td>
</tr>
<tr>
<td>69.9% ≤ X &lt; 60.0%</td>
<td>D – Passing</td>
</tr>
<tr>
<td>X &lt; 60.0%</td>
<td>F – Failing</td>
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</table>

VII. ATTENDANCE AND OTHER COURSE POLICIES

It is the best of student’s interest to attend each class, because of the weight placed on the lectures in the homework and exams. Participation is essential to do well in the class, which includes in-class discussion and direct communication with the instructor and peers.

Discussions and student input are considered an important part of the class. Class exams cannot be retaken other than for an excused absence. Excused absences are limited to medical emergencies that can be certified in writing by a physician, participation in a TAMUCC sanctioned event or other similar circumstances justified in writing and specified in the TAMUCC graduate catalog for the ongoing academic year. Assignments are expected on time unless prior arrangements are made. Such prior arrangements will be granted only in exceptional circumstances as well. Without prior arrangement, the late homework has a 10% deduction if turned in prior to grading of other assignments and 20% if turned in after graded assignments are returned.

*Academic Integrity/Plagiarism*
It is expected that university students will demonstrate a high level of maturity, self-direction, and ability to manage their own affairs. Students are viewed as individuals who possess the qualities of worth, dignity, and the capacity for self-direction in personal behavior.
See Full University Policy at http://catalog.tamucc.edu/content.php?catoid=10&navoid=313#Academic_Integrity

**Dropping a Class**

The grade of W will be assigned to any student officially dropping a course by Friday, April 10, 2015. No student is eligible to receive a W without completing the official drop process by this deadline. Visit the Office of the University Registrar for the Course Drop Form that must submitted. After April 10, 2015 a student will not be allowed to drop a course.

**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 (can be in place of classroom/professional behavior)**

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.

**Grade Appeals (College of Science and Engineering Version)**

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.

**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.

**General Disclaimer**
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.

VIII. SPECIAL NEEDS

Disability Services (DS) is the hub for coordinating services and accommodations to ensure accessibility and utilization of all programs for all Texas A&M University-Corpus Christi students with disabilities. Our services are designed to meet the unique educational needs of enrolled students with documented permanent or temporary disabilities. DS provides intake and consultation services to students seeking to register with our office. DS reviews an individual’s documentation of disability and assesses eligibility for services and the determination of reasonable accommodations. For more information visit the Disability Services Office at 116 Corpus Christi Hall or go to http://disabilityservices.tamucc.edu/

IX. TENTATIVE COURSE PROGRESSION

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Historical review of severe weather and introduction of atmosphere</td>
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<td>2</td>
<td>Introduction of meteorological measurements and weather maps</td>
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<td>3</td>
<td>Introduction of satellite remote sensing</td>
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<td>4</td>
<td>Principle of weather radar</td>
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<td>5</td>
<td>Convection and Single cell thunderstorms</td>
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<td>6</td>
<td>Multiple cells and squall lines</td>
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<td>7</td>
<td>Super cells</td>
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<td>8</td>
<td>Tornados</td>
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<td>9</td>
<td>Hurricanes</td>
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<tr>
<td>10</td>
<td>Hail storms and diurnal cycles</td>
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<tr>
<td>11</td>
<td>Lightning</td>
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<tr>
<td>12</td>
<td>Aviation related hazard and downburst</td>
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<tr>
<td>13</td>
<td>Frontal systems and cyclones</td>
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<tr>
<td>14</td>
<td>Freezing precipitation and lake effect snow</td>
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<tr>
<td>15</td>
<td>Severe weathers related to mountains</td>
</tr>
<tr>
<td></td>
<td>Final Exam</td>
</tr>
</tbody>
</table>

X. BIBLIOGRAPHY

Open Sources

- Weather Prediction Education: http://www.theweatherprediction.com/
- NCAR/RAP Upper-Air Site: http://www.rap.ucar.edu/weather/upper/
- Penn State E-Wall: http://www.meteo.psu.edu/~gadomski/ewall.html
- GOES Satellite Imagery at NASA/MSFC: http://weather.msfc.nasa.gov/GOES/
- National Radar Mosaic: http://radar.weather.gov/ridge/Conus/
- Univ. Wisconsin-Madison model forecast maps (Click MM5): http://aos.wisc.edu/weather/wx_models/Models.htm

Books
Journal papers


Liu, C., 2011: Rainfall contribution from precipitation systems with different sizes, intensities and durations, J. Hydrometeor., 12, 394–412.


DOI:10.1175/2008JAMC1890.1
