Fundamentals of Remote Sensing – CMSS 6310.001
Department of Physical and Environmental Sciences
Fall 2016

A. COURSE INFORMATION
Course number/section: CMSS 6310.001
Class meeting time: TR 12:30 pm-1:45 pm
Class location: OCNR-255
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION
Instructor: Dr. Feiqin Xie
Office location: NRC 3507
Office hours: TWR 3:00-5:00 PM or by appointment
Telephone: 825-3229
e-mail: feiqin.xie@tamucc.edu
Appointments: Email or call for appointment

C. COURSE DESCRIPTION
Catalog Course Description
This course aims to introduce the fundamentals of satellite/airborne remote sensing techniques and demonstrates its application to various aspects of Earth Sciences. Topics include physical principles of remote sensing, radiometry, sensors and sensor technology, and calibration. Various environmental applications for land, ocean and atmosphere research will be also discussed. Students should gain an understanding of the basic principles of the remote sensing and be able to extend its application to areas not yet fully explored.

Extended Course Description
None

D. PREREQUISITES AND COREQUISITES
Prerequisites
Permission from instructor. Basic skills in trigonometry and algebra as well as basic understanding of physics are required.

Corequisites
None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
Required Textbook(s)
None
Optional Textbook(s) or Other References


Supplies
None

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT
By the end of this course, students should be able to:
1. Understand the basics of how electromagnetic energy enables remote sensing and describe why different wavelength in the electromagnetic spectrum are useful for different types of remote sensing.
2. Explain the concepts of spatial, spectral, radiometric and temporal resolution and how they impact the selection of the most appropriate sensors and data source(s) for a particular analytical task.
3. Assess the synergies and limitations of various state-of-the-art sensors and explain if a sensor is useful for particular tasks.
4. Gain hand-on experience in remote sensing data collection, analysis, and interpretation.
5. Design and perform a research project based on one set of satellite remote sensing data and communicate the research activities in a professional and effective manner.

G. INSTRUCTIONAL METHODS AND ACTIVITIES
In class presentation and discussion.

H. MAJOR COURSE REQUIREMENTS AND GRADING
The final grade consists of: homework (35%), midterm (20%), research project (20%), final exam (20%), and attendance and participation (5%). Letter grades will be assigned as follows: A = 90-100%, B = 80-89.99%, C = 70-79.99%, D = 60-69.99% F = 0-59.99%.

Research Project: A research project is required that will involve a detailed investigation of a particular remote sensing technique, dataset or sensor of student’s choosing (subject to instructor’s approval). The student is encouraged to use a remote sensing dataset of particular relevance to his/her research. The project will be graded in two parts:
1) A conference style poster (40%) and a 2-page, single-spaced project description (30%). The
poster should include an overview of the project (problem statement/hypothesis, significance, specific objectives, methodology, data sources, study area), presentation of the results, discussion and conclusions, a careful and clear presentation of figures, and a discussion of sources of error. Note, however, the **2-page project description should be treated as a mini-paper without including figures or tables.** More detailed discussion of the key results (e.g., figures or table) should be presented in the description. The references should also be included but will not be counted for the 2-page limit.

2) A short oral presentation (30%) to summarize the project by the end of the semester.

The poster and the 2-page description should be submitted no later than the end of Week 14 via email attachment, and the oral presentation will be scheduled around Week 15-16.

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<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Exams (Mid-term / Final)</td>
<td>40% (20% / 20%)</td>
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<tr>
<td>Homework</td>
<td>35%</td>
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<td>Papers + Presentations</td>
<td>20%</td>
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<td>Attendance</td>
<td>5%</td>
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### I. COURSE CONTENT/SCHEDULE

The outline of lecture topics and major due dates are listed below.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATE</th>
<th>TOPIC</th>
<th>CHAPTERS</th>
<th>ASSIGNMENTS</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>08-25</td>
<td>I. Historical review of remote sensing</td>
<td>Chap. 1-2</td>
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<tr>
<td>2</td>
<td>08-30</td>
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<td>09-01</td>
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<tr>
<td>3</td>
<td>09-06</td>
<td>II. Basic physical principles of remote sensing</td>
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<td>09-08</td>
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<td>4</td>
<td>09-13</td>
<td>E&amp;M spectrum &amp; resolution</td>
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<td>09-15</td>
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<td>5</td>
<td>09-20</td>
<td>Radiometry background</td>
<td>Chap. 3</td>
<td>HW-01</td>
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<td>09-22</td>
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<tr>
<td>6</td>
<td>09-27</td>
<td>Solar &amp; terrestrial radiation</td>
<td>Chap. 4</td>
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<td>09-29</td>
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<td>7</td>
<td>10-04</td>
<td>III. Spectral characteristics / Analysis</td>
<td>Chap. 8-10</td>
<td>HW-02</td>
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<td>10-06</td>
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<td>8</td>
<td>10-11</td>
<td>Mid-term Exam</td>
<td>EXAM-I</td>
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<td>10-13</td>
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<td>9</td>
<td>10-18</td>
<td>IV. Sensors technology and platforms</td>
<td>Chap. 5-7</td>
<td>Project Title Due</td>
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<td>10-20</td>
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Multispectral imaging systems
Mechanical scanning systems;
Imaging spectrometers & Calibration

V. Application (geosphere, hydrosphere and atmosphere)
Chap. 9-11  HW-03

Retrieval of surface temperature & emissivity
HW-04

Retrieval of surface reflectance
Retrieval of atmospheric property

Reading Day – No Class
Thanksgiving Holiday
Project poster/description Due

Guest Lectures (TBD)
Proj. Slides Due

Project Presentation

Final Exam  EXAM-II

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. Chapters are referred to Schott J.R. (2007)

J. COURSE POLICIES

Students are expected to attend all scheduled classes and to participate in class activities. Group discussions are encouraged. However, you are supposed to work out any assignments individually. Work handed in is assumed to be yours, unless specified to be a group project. Please note that university alcohol and drug policies are strictly enforced.

Attendance/Tardiness
Random attendance sheet will be handed out during the semester. The full attendance will earn up to 5% credit to the final grade.

Late Work and Make-up Exams
You may always turn in assignments early. Except for excused absences, late assignments will result in penalty with reduced grade. If you know in advance that you will have an excused absence when an assignment is due, you must turn in that assignment before its due date. You should turn in assignments that were missed because of an unexpected, excused absence as soon as possible.

There will be NO make-up exams except in extremely rare cases in which some verifiable unforeseen crisis/emergency arises. If you know ahead of time that you have a conflict with the exam schedule, discuss this with the instructor as soon as possible to make arrangements for the exam. Do not expect to arrange different exam schedules
simply because it is more convenient.

**Extra Credit**

Individual extra credit is not possible, but extra points can be earned through extra assignments, which will be announced upon specific notice during the semester. A maximum of 5 bonus points (5% of final grade) are available. Note that Extra Credit cannot be made up.

**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**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**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.