Texas A&M University	Dept. of Forest Science
Course title	**Advanced Remote Sensing**
Course number	**FRSC 661**
Course date	**Fall Semester 2004**
Location	Lecture: **HFSB 101**; Lab: **Centeq B 214**
Meeting day(s)	Tuesday (HFSB 101) and Thursday (Centeq)
Meeting time(s)	Lectures: Tuesday and Thursday 12:45 to 1:35 Lab: Thursday 1:45 to 3:45 (SSL)

Instructor Information

Name	Sorin Popescu
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Office location	Centeq B 221D
Phone	862-2614
WebCT page	https://webct.tamu.edu/ (follow link to Course Listings or use MyWebCT Logon)
Office hours	Monday, 2:00pm-3:00pm. In addition - open door policy, *when* the door is open, though I recommend emailing or calling for appointments. Please put "**661**" in the subject of email messages regarding this class to receive prompt attention. Please avoid "drop-ins" just before class on Tuesday and Thursday.
Teaching Assistant	TBA

Course description

Objectives	The goal of this course is twofold: to introduce students with a basic knowledge of remote sensing to advanced topics in digital remote sensing applications and to instill enthusiasm in this subject area to encourage future specialists. The course emphasizes a hands-on learning environment, with in depth insights into theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Primary focus will be placed on advanced active and passive sensors characteristics, digital image analysis, and processing for a broad range of sensors and applications. Ultimately, the course will empower students to delve more deeply into advanced issues in remote sensing and to customize and develop image processing tools for their particular area of interest.

Textbooks

Required	*Introductory Digital Image Analysis: A Remote Sensing Perspective,* John R. Jensen, Prentice Hall, **Third Edition**, 2004
Recommended	*Remote Sensing Digital Image Processing: An Introduction*, Richards, J.A., and Xiuping J., Springer, 3rd edition, 1999, ISBN 3540648607

Grading

10 point brake-out system	90.0 – 100 = A Excellent 80.0 - 89.9 = B Good 70.0 – 79.9 = C Satisfactory 60.0 – 69.9 = D Passing 00.0 – 59.9 = F Fail	
Lab assignments and homework	30 %	(due at the **beginning** of the following lab period)
Project	25 %	
Midterm exam	20 %	October 14, Thursday, during lecture/lab time
Final exam	25 %	December 15, Wednesday, 8-10 a.m.

Prerequisites

Approval of instructor or one of the following: FRSC 608, RENR 444, GEOG 651, GEOG 661.

Important dates

Midterm exam: October 14th, Thursday, during lecture/lab time

		% of project grade
Project proposal and presentations:	October 21st	5%
Project progress report:	November 4th	10%
Project paper due:	November 25th	75%
Project presentations:	December 2nd	10%
Final exam:	December 15, Wednesday, 8-10 a.m.	

Note: no lab on Thursday, Nov. 18: classes will be dismissed at 1:30pm for Bonfire Memorial Dedication (2:30pm)

Tentative course and laboratory outline

Week	Topic
1	Definition of terms; Visualization of remote sensing data; Electromagnetic spectrum and radiation laws as they relate to remote sensing.
2	Active and Passive sensors, sensor platforms (airborne & satellite). Review of the remote sensing process. Understanding the capabilities of today's sensors for various types of applications.
3	Image processing considerations and processing techniques.
4	Advanced image processing. Review of basic concepts and methods of image classification. Hybrid classifiers.
5	High resolution imaging satellites and applications. High-resolution digital airborne imagery. Image analysis and processing issues. Guest speaker.
6	Active sensors: lidar. Sensor types: waveform vs. small footprint with intensity. Lidar instrumentation. Basic lidar concepts.
7	Lidar-derived elevation: bare Earth DEMs and applications in urban areas, topographic mapping, forestry.
8	Lidar image geometry. 3D feature extraction.
9	Planning a lidar acquisition; deciding upon data collection characteristics. Fusion with multispectral and hyperspectral data.
10	Microwave remote sensing: active and passive sensors. Radar.
11	Types of imaging radar: SAR, InSAR, science applications. Fusion of microwave remote sensing.
12	Hyperspectral remote sensing. Current sensors and applications in natural resources. Guest speaker.
13	Hyperspectral information extraction. Advanced processing techniques.
14	The digital revolution in remote sensing: What's next? Final exam review

Laboratory, Homework, and Exam policy

The University policy on Scholastic Dishonesty will be enforced in this course. While you are encouraged to help each other understand concepts and techniques, all work submitted should be your own. Exceptions to this policy will be explicitly noted by the instructor and should not be assumed by students. Make-up exams will not be offered. If you are going to miss an exam for a valid reason (per University rules), **contact the instructor** well in advance.

All laboratory and homework assignments are to be completed in a neat, logical, and clear fashion. A 10% reduction in grade, up to a maximum of 50%, will be assessed for each weekday an assignment is handed in late. Assignments will not be accepted if more than 5 weekdays late, unless documented excuse is presented (family or medical emergencies).

Laboratory reports

Unless otherwise indicated, all laboratory exercises must contain a brief report following the format guidelines given below. The report should be divided into **Introduction, Methods, Results and Discussion, and Conclusions** sections, and should tie together and synthesize the lecture, readings, and practical exercises. Each laboratory exercise will be due the following laboratory period, at the beginning of class, unless otherwise indicated. Instructor may give extra credit to students that

Projects

Each student is required to design and implement a class project. The project must use digital image source data and the student must develop a specific output product useful in his own field of interest for applying remote sensing. The project is designed to (1) build upon and synthesize techniques or concepts demonstrated in class, and (2) let you explore your own data sets and research objectives using your developing remote sensing "toolkit." Work that contributes to your thesis research or current employment is encouraged. Students may write their own image processing software, using IDL, as an integral part of the project; however, a specific (useful) output product must be one result of the project. Group projects tackling larger research or management issues are encouraged. All projects require instructor approval.

A proposal (150-word maximum) and outline describing the project and **proposed methods** must be turned in by the date indicate in the *Important dates* section. However, students are encouraged to turn in proposals as soon as is feasible. The proposal/outline should contain at least **five** preliminary references. The final report must be no more than twenty pages in length including figures and references, and the final report and summary/outline must follow the format guidelines for papers and laboratory reports. Failure to follow these guidelines will result in the paper not being accepted. The final report must include an **abstract** of no more than **150 words** that is succinct and informative without reference to the text. This should be followed by the **Introduction (including** a thorough literature review**, with Background** and **Objectives**), **Methods, Results, and Discussion/Conclusions**.

Keep in mind that these are semester projects. Laboratory time will be provided for work on your project during the semester, but will be insufficient by itself. A 2-5 page project progress report is required at the start of class as indicated in the *Important dates* section. Well-chosen student projects may be suitable for **subsequent publication** in either conference proceedings or the peer-reviewed literature. Please keep this goal in mind as you develop and carry out your projects, and particularly as you prepare your final reports.

Format Guidelines for Papers and Laboratory Reports

Papers and lab reports must be double-spaced (using a 12-point proportionally-spaced font) with 1 inch margins all around. Captions, references, footnotes, appendices, tables, etc. may be single-spaced. Figures and tables are encouraged when they serve to illustrate or clarify a point. They should be inserted in the text. Each page following the first full page of text should have a page number in the upper right corner or bottom center. A title page may be supplied; however, reports in special binders of any kind will generally not be accepted. In text citations and references should follow the guidelines for manuscripts submitted for publication to the *American Society of Photogrammetry and Remote Sensing* (http://www.asprs.org/publications.html), for *Photogrammetric Engineering and Remote Sensing (PE&RS).*

Lab reports should be printed on one side of 8.5 by 11 inch white paper. Final projects must be printed using the same criteria. Students are required to keep photocopies and/or **electronic** copies of all work submitted.

Aggie Code of Honor

Aggies do not lie, cheat, or steal,
nor do they tolerate those who do.

The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other.

Americans with Disabilities Act

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 contact the Office of Support Services for Students with Disabilities in Room 126 of the Student Services Building. The phone number is 845-1637.