GEO 455 / 555
ENVIRONMENTAL REMOTE SENSING

Spring 2010
Thursday 4:30 – 7:00 pm SC377

INSTRUCTOR:

Dr. Umesh K. Haritashya
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OFFICE HOURS:

Room number- SC 378
Thursday 1:00 – 3:00 pm
(also open door policy).
Other times by appointment.

TEXTS (required): Jensen, John R., 2007, *Remote Sensing of the Environment: An Earth Resource Perspective*, 2nd Ed., Upper Saddle River, NJ: Prentice Hall, 592 pages. This textbook covers many topics in great depth, therefore, can be difficult reading at times, but this is by far the best available in market from technical and earth resource application point of view. For the physics part of the course I'll be using two other books because it is not very well covered in the assigned textbook. I'll provide necessary information and handouts when needed. Other type of material that will be used includes research articles and some on-line materials. You may also have to do some browsing to find-out most suitable research articles related to the topic of discussion. Also, please see additional suggested readings and web page (last page).

The exams and quiz for this course are based mainly on lecture, so use your lecture notes as a guide in deciding which parts of the text are most important for this course. However, reading all of the assigned sections carefully will undoubtedly help you understand course material, and will give you a solid background in many areas of remote sensing.

COURSE DESCRIPTION: Environmental Remote Sensing is designed to introduce students to remote sensing science and technology. It emphasizes mastering fundamental remote sensing concepts and utilizing remotely sensed data for environmental information extraction and problem solving. Students will develop a basic understanding and working knowledge of the principles and applications of remote sensing including satellite multispectral data sets, matter-energy interactions, radiation transfer theory, image interpretation, computer-assisted analysis, and remote sensing applications. It will also provide a survey of the concepts and techniques of remote sensing and image analysis for mapping and monitoring natural resources, environment and land use and a wide spectrum of geoscientific applications ranging from meso- to global scale. It will also cover how remote sensing is used as a tool of geo-exploration.

COURSE OBJECTIVES: At the end of this course you will be able to:

- Understand the fundamental concepts and principles of remote sensing
- Understand the advantages and limitations of remote sensing
- Understand the methods and techniques of remote sensing
- Apply remote sensing techniques to resource inventory, monitoring and analysis
- Apply remote sensing techniques to geological analysis, ranging from laboratory spectra of minerals and rocks, ground truth, to aerial and space-borne remote sensing.
- Understand the potential of contemporary image processing and analysis systems
- Choose remote sensing data and analysis approaches based on the problems to be solved.
- Negotiate the interface between remote sensing and other geospatial technologies
- Plan and implement a remote sensing project
- Understand the prospects for future sensing systems and applications

TENTATIVE LECTURE SCHEDULE:**

Week (Date)	Week's Topic	Quiz / Exam/Due	Project / Discussion / Term paper
Week 1 (Jan 7)	Chapter 1: Remote Sensing of the Environment		Syllabus discussion Short assignment
Week 2 (Jan 14)	Chapter 2: Electromagnetic Radiation Principles	Due: Short assignment	Introduction to the software
Week 3 (Jan 21)	Chapter 3 and 4: Aerial Photography		Project 1
Week 4 (Jan 28)	Chapter 5: Elements of Visual Image Interpretation	Quiz 1 Due: Assignment 1	Project 2
Week 5 (Feb 4)	Chapter 6: Photogrammetry	Due: Assignment 2	General remote sensing discussion
Week 6 (Feb 11)	Chapter 7: Multispectral Remote Sensing Systems		Project 3
Week 7 (Feb 18)	Chapter 8: Thermal Infrared Remote Sensing	Quiz 2 Due: Assignment 3	Project 4
Week 8	**Exam 1**		

(Feb 25)			
Week 9 (Mar 4)	**Mid-term break**		
Week 10 (Mar 11)	Chapter 9 and 10: Active and Passive Microwave Remote Sensing and LIDAR	Due: Assignment 4	Project 5
Week 11 (Mar 18)	Chapter 6 (*from Lillesand, Kiefer and Chipman book*) Digital Image Interpretation and Analysis	Quiz 3 Due: Assignment 5	Project 6
Week 12 (Mar 25)	Chapter 11: Remote Sensing of Vegetation	Due: Assignment 6	Project 7
Week 13 (Apr 1)	**Easter-recess**		
Week 14 (Apr 8)	Chapter 12 and 13: Remote Sensing of Water and Urban Landscapes	Quiz 4 Due: Assignment 7	Project 8 Graduate student term paper presentation
Week 15 (Apr 15)	**NO Class (AAG Meeting in Washington)**		
Week 16 (Apr 22)	Chapter 14: Remote Sensing of Soils, Minerals, and Geomorphology	Due: Assignment 8	Project 9
Week 17 (Apr 29)	**Final Exam 4:30 – 6:20 pm** Due: Assignment 9		

******will announce changes, if any, in the classroom/Isidore

COURSE WEB SITE: This course will utilize the Isidore Learning Management System - http://isidore.udayton.edu . Use your Novell (LDAP) username and password to log into the system and click on the course tab to enter the site. The site may be used for a variety of things including, announcements, lectures, handouts, assignment submissions, discussion forums, and other informations. If you cannot log into the site, or if you have any problems viewing or accessing the course tab once you've logged in, it's your responsibility to contact the UDit Help Desk for assistance at x93888 (937-229-3888 – off campus). If you've registered for the class late it may take 24-48 hours before you gain access to the site. For specific questions about course assignments and deadlines, please contact the instructor (me). In most cases students will gain access to course sites 2-3 days before the semester begins and lose access 2 weeks after the semester ends. Please make sure that you are **checking your Isidore at least two/three times a week**. Isidore arrangements are as follows:

- **Announcements**: This tool will be used frequently to alert the class of important information and instructions.
- **Schedule**: I will try to add all assignments and quiz due dates so keep following. This information is also available here in this syllabus. Please make sure to check syllabus.
- **Syllabus**: This tool contains syllabus and has all the pertinent class information. It is available at all time.

- **Modules**: This tool will contain weekly folders which will have all PowerPoint's and other related materials for that week.

- **Tests & Quizzes**: It is possible that you may be asked to take online quiz and exam via this tool. I will announce that in class, if I prefer to do so.
- **Assignments**: Assignments will be available here. Please click this folder to access your assignment. You will have to submit your assignment via this tool.
- **Forums**: This tool can be used for site-wide threaded discussion. Because this is once a week class, so I encourage all of you to use this tool for class related interaction with other students as much as you can.
- **Chat Room**: You can use the Chat Room tool for real-time, unstructured conversations among site participants who are signed on to the site at the same time.
- **Messages**: This is your course mailbox.
- **Gradebook**: Checking grades are always good to view your progress in the course.

CLASS STRUCTURE: The structure of weekly lectures will be require your active and consistent participation.

- Each class will start with 1-hour introduction/lecture/review of the key concept of that day's topic followed by five minutes of break.
- Second hour will contain more detailed explanation of the topic and example demonstration.
- Last 30 minutes of the class will be devoted totally on assignment related to that day's topics, and/or open discussion.
- Your involvement throughout the class is very important. *Therefore, missing class is not appropriate and will seriously impact your grade.*

PROJECT-BASED ASSIGNMENTS: Class projects will provide students with hands-on experience and demonstrate basic interpretation and processing of remote sensing images. Projects will also provide practical, hands-on experience. All lectures will have complementary project so that we can develop both the theoretical perspective and hands-on-experience in class. Early exercises will familiarize you with the basic structure of the software. Later exercises will introduce various techniques including image enhancement (visualization), adding geographical coordinates to images, data transformation approaches to extract specific information, and classification approaches for mapping land cover.

Project files will be provided through Isidore, but if file is too big then I can ask you to transfer file directly into your computer from mine.

SOFTWARE: In this course we will be using ERDAS imagine 9.3 software. You are required to stop-by in my office and install software in your laptop. Computer requirements for this software are provided in a separate sheet. Make sure your laptop has plenty of space because files needed to work on your assignment could be huge. After all you are dealing with the space image ☺ Most of the assignments will be based on this software, but not all!

Because this software is server version, you will be required to have valid internet connection before you can use it. Every time you try to use the software your system will have to ping in to

UD's server. Try to avoid opening any outside site (especially illegal sites) when you are using this software. Sometime this software might not work outside campus.

TERM PAPER (Graduate students only): The two point objectives of the term paper are:

- Exploring in depth some aspect of remote sensing applications related to your major or of personal interest to you.
- Providing experience in the formulation, execution, preparation, and presentation of original research.

TERM PAPER EXECUTION: INTRODUCTION: Your instructor will act as your project leader for the semester. As in any research project, the project members (in our case you as a student are the member of the project) hold the final responsibility for the successful completion of the project, but project leader keeps control of the project. Consequently, the project leader will steer your project as you progress. The emphasis of the project leader - and of the project - is the final paper. The milestones are simply a way to get you to the final paper in a structured manner. Your project leader is always available to help you, so remember that asking questions is always preferable to making bold assumptions. I also want to emphasize that student has the final responsibility for the successful completion of the term project, not me.

EXECUTION: Five term paper milestones are due over the course of the semester.

- Talk to me about your idea and possible term paper topics on or before **January 22, 2010**. You can consult suggested readings from the last page.
- Prepare 1-page proposal on your idea for the term paper and submit on or before **February 18, 2010**.
- Give a brief presentation (informal) of the progress you have made with your paper in class and discuss it with fellow students as well as your instructor on **March 11, 2010.**
- Present a final report orally in class on **April 8, 2010**. You will have about 15 minutes for your presentation.
- Submit a written report (8-10 page double space) before the last day of classes.

Completion of every successful milestone is required and it will reflect in your grade.

PROFESSIONAL STYLE: It is not too early to get used to producing professional quality work. This refers to the content as well as to the style. Make certain that your work looks neat and professional, using a word-processor and laser-printer or letter-quality printer. If graphics are required as part of your paper, prepare them using a graphics program.

PEER EVALUATIONS: The presentation will be evaluated by your classmates in predefined format. This evaluation will be confidential - the instructor will NOT share it with anybody else in your team or in the class. These evaluations will, however, impact your eventual grades.

CLASS REQUIREMENT: The instructor will cover the topics on the days assigned in the syllabus. This is a quantitative course; therefore, students should have read the topics and be prepared to discuss them in the class. Additional handouts and current topics will also be discussed in class. You can also discuss current topics, if you want to.

GRADING: Late assignments have a half life of two weeks (i.e., if turn it in two weeks late, your maximum grade is 50%). Remember that turning in assignments late is the worst way to lose points!! If unavoidable circumstances prevent you from taking an exam/quiz/assignment, discuss this with me beforehand, if at all possible, or immediately afterward. Make-up work can only be arranged if this is done in a timely fashion.

Quiz: Four multiple choice 15 minute quiz during the semester. 25 points each – 100 points total.

Exams: Class will have two 100 point exams during the semester. First, just before the mid semester break and second exam will be our final exam. The exam format will include multiple choice, true false, short answer, short essay, and diagram completion exercises. The final exam is NOT cumulative but will require you to synthesize material from the entire course.

Project-based assignments: Project assignments must be turned in one week after they are assigned. It is essential that you complete the projects because many of them are sequential and build on knowledge you have gained from the previous exercise. You are *encouraged* to collaborate with each other, but do not copy each others' written answers and/or interpretation. I expect all answers to be written legibly in complete sentences with all words correctly spelled.

Grade Distribution:

Four quizzes (25x4)	= 100	94.0% & above	A
Two exams (100x2)	= 200	90.0% - 93.9%	A-
Project assignments	= 900	87.0% - 89.9%	B+
Class participation	= 50	83.0% - 86.9%	B
TOTAL ----------	1250	80.0% - 82.9%	B-
		77.0% - 79.9%	C+
		73.0% - 76.9%	C
		70.0% - 72.9%	C-
		65.0% - 69.9%	D
		Below 65.0%	F

Term Paper (only for graduate students): Term paper grades will be divided on five milestones (discussed earlier) as 5, 15, 20, 30, 30 respectively. Exception will be your oral presentation. Highest scored (through peer evaluation) presentation can get 5 point extra credit. In case of more than one highest point your project leader (instructor) will have final say!

So, for graduate students total point will be 1350.

Note: To do well in this course, you need to perform well in all aspects of the course!

TAPE-RECORDING CLASS-SESSIONS: Tape-recording of class-sessions without prior, specific permission of the instructor is not allowed. Even when such permission is given, the student must agree that the recordings are for the personal use of the student and will not be shared with anyone else either by means of the original tapes, copies of the tapes, or any kind of transcription of the tapes. Moreover, the student must agree to erase or otherwise destroy the tape-recorded matter upon the completion of the course or upon withdrawal from the course.

COMMUNICATION

- Communication is very important. My policy in regular semester is to respond to student emails within 48 hours.
- My email address: **Umesh.Haritashya@notes.udayton.edu**. You can also email me through the Isidore site through "Email Me".
- If you want immediate response, please make sure you copy your e-mails to my gmail account (**ukharit@gmail.com**). I can access my gmail account via phone and would be able to respond – as long as I am on planet Earth. In any case you are always required to send copy of e-mails to my official University of Dayton account.
- I also post frequent announcements to the front page of the Isidore site and often send emails to the class. Therefore, it is important to check both places regularly.
- If I need to make exceptions to the 48-hour policy (i.e. family emergency), there will be an announcement posted on the front page of the Isidore site and an email sent out to the entire class.
- If I haven't responded within 48 hours, please email me again—it is possible that your email did not reach me. Also, please check to make sure that my reply isn't caught in your spam filter.
- If you are sending an e-mail containing general information then it is possible that I may not respond. Example of such an e-mail would be: My car broke and I won't be able to attend class tonight.
- Please be sure that the email listed for you in Isidore is the one you check most frequently. If it isn't please change it. Also, make sure you use your university e-mail account. If you want to use some other account, you can use automatic forwarding option.
- If you want to speak to me in person or on the phone, my regular office hours are on Thursday, 1:00–3:00 PM. I can also make appointments at other times. My office phone number is 937-229-2939. You are also welcome to knock my office door (Science Center Room 378) and I will be happy to entertain you, if I am there and not busy.
- You are required to communicate with your group. Remember – it is your responsibility to complete group exercise.

PROFESSIONALISM AND CLASS PARTICIPATION: As you know, this is once a week class. Therefore, I expect a good deal of class participation and interaction among students themselves. There are no free absences in this class. Overall, attendance is expected and will be reflected in your ability to perform on examinations and project based assignments. In addition, attendance will be considered as a deciding factor for students with "borderline" grades.

Please treat your cell phone (and/or pager) only as an emergency contact tool during the class. I expect that your friends, family, and coworkers are aware of your schedule and would call you only when they absolutely have to. Also, please be considerate of your colleagues and put your cell phone or a pager on a vibration mode. Please excuse yourself out of the class when taking an emergency call.

SUPPORT FOR YOUR LEARNING IN THIS CLASS: The LTC's Office of Student Learning Services (SLS) is a learning resource for all students at the University of Dayton. SLS offers a wide variety of services to assist you in achieving academic success at the University, including study skills classes and workshops, tutoring and consultations, disability screenings, and a web site

with many resources (http://learningservices.udayton.edu). Please contact SLS at 937-229-2066 (937-229-2059 TTY) or visit the office on the ground floor of Roesch Library (LTC 023) if you would like to talk about how you could become a more effective learner.

- **Writing support:** The Write Place offers peer-to-peer writing support on any writing assignment and at any stage of the writing process. You can drop in to the Write Place without making an appointment. The Write Place is located on the 2nd floor of Roesch Library. Contact the Write Place Coordinator at 937-229-2068 if you have any questions. You can also visit the Office of Writing, Research, and New Media's website at http://learningservices.udayton.edu/writeplace/ for more information.
- **Students with disabilities**: Your learning in this course is important to me. I invite you to talk with me about ways to ensure your full participation in the course. If you feel you need an accommodation based on the impact of a disability, please contact me privately to discuss your Self-Identification Form as provided by the LTC's Office of Student Learning Services (SLS). It is important that you be registered with SLS and notify me of your eligibility for reasonable accommodations in a timely manner, and, when appropriate, that we make special arrangements in case of an emergency building evacuation. For more information about disability services at the University of Dayton, please contact SLS at 937-229-2066 or 9370229-2059 TTY, by email at disabilityservices@udayton.edu or stop by SLS in the LTC, room 023.

ACADEMIC DISHONESTY: Academic Dishonesty refers to forms of cheating and plagiarism which results in students giving or receiving unauthorized assistance in an academic exercise or receiving credit for work which is not their own. Forms of academic dishonesty includes: **Cheating:** intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise. The term academic exercise includes all forms of work submitted for credit or hours. **Plagiarism:** the deliberate adoption or reproduction of ideas, words or statements of another person as one's own without acknowledgement. **Fabrication:** intentional and unauthorized falsification or invention of any information or citation in an academic exercise. **Facilitating academic dishonesty:** intentionally or knowingly helping or attempting to help another to violate a provision of the institutional code of academic integrity.

Academic dishonesty in any form is viewed as one of the most serious offenses against the good order of the educational community. Any individual or group of students found cheating or plagiarizing is subject to the University disciplinary procedures in addition to any action taken by the faculty member of the course involved. For more detail about undergraduate academic dishonesty please visit: http://bulletin.udayton.edu/content.ud?v=29&p=3286&c=3313 For more detail about graduate academic dishonesty please visit: https://bulletin.udayton.edu/content.ud?v=28&p=3143&c=3201

- **The Honor Pledge:** I understand that as a student of the University of Dayton, I am a member of our academic and social community. I recognize the importance of my education and the value of experiencing life in such an integrated community. I believe that the value of my education and degree is critically dependent upon the academic integrity of the university community, and so in order to maintain our academic integrity, I pledge to:

- ✓ Complete all assignments and examinations by the guidelines given to me by my instructors;
- ✓ Avoid plagiarism and any other form of misrepresenting someone else's work as my own;
- ✓ Adhere to the Standards of Conduct as outlined in the Academic Honor Code.

In doing this, I hold myself and my community to a higher standard of excellence, and set an example for my peers to follow.

ADDITIONAL READINGS (not required):

1. Campbell, J.B. 2007. Introduction to Remote Sensing, 4th Edition, The Guilford Press.
2. Lillesand, T.M., Kiefer, R.W. & Chipman, J.W. 2008. Remote Sensing and Image Interpretation, 6th Edition, John Wiley and Sons.
3. Barrett, E.C. & Curtis, L.F. 2007. Introduction to Environmental Remote Sensing, Routledge Publisher.
4. Gupta, R.P. 2003. Remote Sensing Geology, 2nd Edition, Springer.
5. Journals:
    a. International Journal of Remote Sensing
    b. Remote Sensing of Environment
    c. Computers and Geosciences
    d. Journal of Photogrammetry and Remote Sensing
    e. Photogrammetric Engineering and Remote Sensing

    ~ Many More: Contact me if you want to know more or want to read any specific topic!