Digital Image Processing and Analysis
GEO827, 4 credits, Fall 2015
Department of Geography, Michigan State University

Instructors

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Course web page:

We will distribute the course syllabus, schedule, presentation files, readings, assignments, evaluation policies, and grades through email listserv. We will also post current events in Terrestrial Remote sensing/Ecosystem ecology, career opportunities, or items that the students find relevant for the course.

Lecture: Tu Th; 5:20-6:10 pm; GEO201
Lab: Tu Th; 7:00-8:50 pm; GEO201

Office hours:

4:00 – 5:00 pm: GEO206 (Dr. Chen)
7:00-8:50 pm; GEO206 (Dr. Ranjeet) and GEO201
or by appointment

Description

This course presents cross-disciplinary concepts in the application of principles and theory to the study and maintenance of diversity in temperate and tropical systems. The course will include lectures, classroom discussions, readings, video, and field excursions.

Pre- or co-requisites

GEO324 (Remote Sensing of Environment) or 424, Advanced Remote Sensing or consent of instructors. You need to have a decent grasp of remote sensing. If not, read Jensen, J.R. (Remote Sensing of the Environment: An Earth Resource Perspective)

Required text

1) Jensen, J.R. Introductory Digital Image Processing – A remote sensing perspective, 4th ed. Prentice Hall, 2015, ISBN-10: 013405816X • ISBN-13: 9780134058160.

(Option to rent from Amazon for $56 (http://www.amazon.com/Introductory-Digital-Image-Processing-Perspective/dp/013405816X)

2) Jensen, J.R. Introductory Digital Image Processing – A remote sensing perspective, 3th ed., 2005 (On reserve at the library)

Note: We will make electronic copies available of required papers

Some recommended references

1) Schowengerdt, R. A. Remote sensing – Models and Methods for Image Processing, 3rd ed., Academic Press, 2006
2) Jensen, J.R., Remote Sensing of the Environment: An Earth Resource Perspective (2nd Edition), Prentice Hall, 2006, ISBN-13: 978-0131889507
3) Lillesand, T., Kiefer, R.W., J. Chipman, Remote Sensing and Image Interpretation, 7th edition, Wiley, ISBN-13: 978-1118343289
4) Russ, J. The Image Processing Handbook, 4th ed., CRC Press, 2002

Recommended Journals

Remote Sensing of Environment, International Journal of Remote Sensing, Remote Sensing, PE & RS, ISPRS PE & RS, Landscape Ecology, Landscape and Urban Planning, Land Use Policy, RS & GIS, Environmental Research Letters, Global Change Biology, Journal of Geophysical Research Letters-Biogeosciences, IEEE J-STARS, etc.

More journals can be found at:
http://www.aboutgis.com/gis-and-remote-sensing-journal-list-with-impact-factors/
http://www.scijournal.org/geoscience-journal-impact-factor-list.shtml

Computing Though we will be working in the GEO201 lab, please bring your laptop for flexibility, so you can install software to work around admin. privileges which the instructor does not have.

Grading

The grades will be based on one midterm and one comprehensive final, and eleven lab assignments. The breakdown of points and percent of final grade is in the table below.. Homework assignments (paper copies/soft copy) are due at the start of class on the date given in the schedule (below) and are the product of independent thinking and writing of each student. In fairness to students who hand their work in on time, there is a 20% grade penalty for every day (incl. weekends) the assignment is late.

	Points	% of Final Grade
Lab exercises	50	50
Midterm exam	20	20
Final exam	30	30
Total	100	100

Sept 17 is the last day to withdraw from the course and receive a "W" grade (please confirm, https://reg.msu.edu/ROInfo/Calendar/academic.aspx). Unless a student

withdraws him/herself by this date, he/she will remain enrolled in the class and will be graded. “IN” grades are only given in extraordinary cases when unexpected conditions prevent the student from completing the requirements of the course within the term of enrollment.

Attendance

There here is no university-wide regulation requiring class attendance. However, attendance is an essential and intrinsic element of the educational process. In any course in which attendance is necessary to the achievement of a clearly defined set of course objectives, it may be a valid consideration in determining the student's grade. It is the responsibility of the instructor to define the policy for attendance at the beginning of the course. Students may be dropped from a course for non-attendance by a departmental administrative drop after the fourth class period, or the fifth class day of the term of instruction, whichever occurs first.

Academic Honesty

Students are expected to adhere to principles of academic honesty in all aspects of this course. We follow Michigan State University policies on academic integrity (https://www.msu.edu/unit/ombud/academic-integrity/student-faq.html).

Note: Any student who, because of a disabling condition, may require special arrangements in order to meet course requirements should contact us soon as possible so that necessary accommodations can be made.

Date	Week	Lectures(5:20-6:10pm) GEO bldg, Rm 221	Labs (7-8:50pm) GEO bldg, Rm 221	Points
9/3/2015	1	Course intro/ Radiometry and atmospheric characteristics		
9/8/2015	2	RS overview	Lab Exercise 1: Digital Image Processing Software - ERDAS Imagine	4
9/10/2015	2	Radiometry and atmospheric characteristics	Lab Exercise 2: TOA reflectance computation with Landsat images	5
9/15/2015	3	Atmospheric characteristics and atmospheric corrections	class picks Landsat scenes for Lansing/SENA cities	
9/17/2015	3	Atmospheric characteristics and atmospheric corrections	Lab Exercise 3:Atmospheric correction: 6s and TOA-Surface reflectance	5
9/22/2015	4	Atmospheric radiative transfer modeling	…(http://6s.ltdri.org/pages/run6SV.html), FLAASH demo if license prob. solved	
9/24/2015	4	Bidirectional effect, modeling and correction	Lab Exercise 4: Bidirectional correction: Build BRDF model in Spatial Modeler	5
9/29/2015	5	Bidirectional effect, modeling and correction	Lab Exercise 5: Field Radiometry (ASD spectro-radiometer, indoors)	
10/2/2015	5	EOS systems (e.g., MODIS products)	…	
10/6/2015	6	EOS systems(MODIS products continued)	Lab Exercise 6: Biophysical attributes retrievals with MRT (batch processing)	5
10/8/2015	6	Climate datasets (CRU 3.22, TRMM, GPM)	…	
10/13/2015	7	Spectral transformation (1): water stress Is	…	
10/15/2015	7	Spectral transformation (2): VI theory, soil line slope	…	
10/20/2015	8	Spectral transformation (3): PCA and TCA, Water stress II	…	
10/22/2015	8	Midterm Exam	No Lab	
10/27/2015	9	Environmental Biophysics/Ecosystem ecology (functional var.,GPP/ET)	Lab Exercise 7: Spectral transformation - Spectral vegetation indices and PCA	5
10/29/2015	9	Hyperspectral sensors		
11/3/2015	10	Land use and land cover classification, mapping, and analysis	Dr. Dave Lusch (classification methods, applications)	
11/5/2015	10	land use cover classification (methods)/Change detection analysis		
11/10/2015	11	Hyperspectral sensors (AVIRIS/CAO)	Lab exercise 8: Kyla Dalhin lab (spectral unmixing / Multiple Endmember Spectral Mixture Analysis)	5
11/12/2015	11	Community Land model parameterization with RS		
11/17/2015	12	Change detection analysis	Lab Exercise 9: Land use and cover classification (/accuracy assessment and validation), Ecognition	4
11/19/2015	12	Environmental applications - Vegetation dynamics-grasslands	…	
11/24/2015	13	Environmental applications - Agricultural monitoring and analysis	Lab Exercise 10: Change detection analysis (urban sprawl) OR (deforestation and rangeland)	4
11/26/2015	13	Holiday	No lab	
12/1/2015	14	Environmental applications - Water resources assessment and monitoring	Lab Exercise 11: Biophysical attributes retrievals (water quality) Zutao /SeaDas/Chla	4
12/3/2015	14	Environmental applications - Forest monitoring and analysis	…	
12/8/2015	15	Environmental applications - Urban change mapping and analysis		4
12/10/2015	15	Environmental applications - Fire (MODIS product)	…	
12/14/2015	16	Final Exams 12/14-12/18		