SYLLABUS WINTER 2018

ESRM430: Remote Sensing of the Environment

Lectures:	TTh 12:30 – 1:20 ROOM: MOR 220
Labs:	Session A: T 2:30 – 3:50 BLD261 Session B: T 4:00 – 5:20 BLD261 Session C: Th 2:30 – 3:50 BLD261 Session D: Th 4:00 – 5:20 BLD261
Course Web Site:	http://sites.uw.edu/ESRM430
UW Canvas:	https://canvas.uw.edu/courses/1127712
Instructor:	Dr. L. M. Moskal
Contact Info:	Office – Bloedel 382 http://sites.uw.edu/lmmoskal lmmoskal@uw.edu cell: 206.225.1510
Office Hours:	by appointment
Lab Instructor:	Jonathan Batchelor
Contact Info:	Office – Bloedel 357/389 esrm430@uw.edu
Office Hours:	in Bloedel 357/389 1:30-2:30 T & Th & by appointment

UW Canvas: https://canvas.uw.edu/courses/1099357
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Course summary: (5 credits = 2 lecture credits + 3 lab credits) Students will be exposed to the principles of photogrammetry, image & point cloud interpretation & hyperspatial (high spatial resolution) remote sensing applications in natural resource management. In the first half of the course, manual & computer based laboratory exercises emphasize conventional analysis of aerial photographs & high resolution satellite imagery. Students will have the opportunity to apply these principles & obtain hands-on experience. The second half of the course focuses on the application of active remotely sensed data, specifically LiDAR (Light Detection & Ranging). The uses of hyperspatial remotely sensed information for wetlands, watersheds, forest resources, wildlife habitat, point & non-point pollution, environmental monitoring, land use planning, urban-suburban-forestry interfaces, & outdoor recreation will be discussed & illustrated using research examples throughout the course. Practitioners & users from public & private institutions may be involved as guest lecturers. Students will come out of this course with a mastery of a wide variety of interpretation, measurement, environmental monitoring & map making skills specific to hyperspatial remote sensing.

Course objectives: To develop an understanding of hyperspatial remote sensing fundamentals & the ability to interpret & manipulate high-resolution remotely sensed images & datasets. Students will be presented with the traditional & 'state of the art' image processing techniques, & a firm theoretical & practical background in hyperspatial remote sensing applications. By the end of the course students will be expected to evaluate available remote sensing data sources & design simple projects related to environmental applications.

Textbooks

The course spans some traditional & very new sub-branches of remote sensing, thus, there is no one textbook that would best fit the class content. Most of the readings you are expected to do are peer-reviewed literature reviews & research articles & are listed on Canvas. Below are suggested optional textbooks that relate to the course content, some are on hold for you at the Odegard Library.

- Thomas Lillesand, Ralph W. Kiefer & Jonathan Chipman, 2015. Remote Sensing & Image Interpretation, 7th ed. Wiley, p768.
- James Campbell & Randolph Wynne, 2011. Introduction to Remote Sensing, 5th ed. The Guilford Press, p.667.
- Thomas Blaschke, Stefan Lang & Geoffrey Hay, 2008. Object-Based Image Analysis: Spatial Concepts for Knowledge-Driven Remote Sensing Applications (Lecture Notes in Geoinformation & Cartography). 1st ed. Springer, p. 836
- Kathryn Keranen & Robert Kolvoord, 2015. Making Spatial Decisions Using GIS & Lidar: A Workbook, 1st ed. ESRI Press, p. 264.

Other Resources:

- Lab software is available (its freeware) from the links in the 'Labs' section of the class website, you can install it on your personal computers, but we do not provide support.
- Aerial photography & other map resources at the UW Libraries can be found at: http://www.lib.washington.edu/maps/ -- I will let you know if you need them

Required Course Supplies: USB flash drive for archiving your course work (1GB recommended).

Undergraduate Student Grading:

Midterm	20%
Labs (9)	45 %*
Lab 10 – Final Project	25%
Random Quizzes (3-5)	10 %

Approximate letter grades will be 93% (A=4.0), 82 % (B= 3.0), 71 % (C= 2.0), & 60% (D= 1.0). You will fail the course if your cumulative % is below 59 % (F = 0.0).

Graduate Students ONLY: *Annotated Bibliographies

Graduate students do not submit labs. Every week, starting week two, an annotated bibliographic reference based on a remote sensing - theme refereed journal article will be due at the beginning of each lab session; for a total of 9 annotated bibliographies. Thus, graduate student are expected to attend the labs, however, the annotated bibliographies will substitute for the lab grade, midterm grade & Final Project (Lab 10 grade) totaling 90% of the graduate student grade; the remanding 10% of the graduate student grade is based on quizzes.

Instructions on how to produce an annotated bibliography are available at Cornell Library Site.

Each bibliographic reference will be graded as follows: 10 pts = Excellent, 8 pts = Good, 6 pts = Fair, 4 pts = Poor, 0 pts = Late or did not hand in.

Assignments, Lab, Exam Submissions: Use the ESRM 430 Digital Dropbox to submit your labs, midterm, final & annotated bibliography. Always use your name in the file name of your submission. Always assure that you are uploading files to the correct folder. You will have till the start of the next lab session to submit your lab.

Course Policies:

- Missed Exams/Quizzes & Late Labs/Assignments: The UW policies will be followed to determine whether a make-up exam or quiz would be given or late labs/assignments allowed.
- Academic Integrity Statement: Please follow the UW policies on cheating & plagiarism: http://www.washington.edu/students/handbook/conduct.html. For more information on the University's academic integrity policy, definitions & examples of academic misconduct, please refer to: http://depts.washington.edu/grading/issue1/honesty.html
- Students with Disabilities: If you have a disability that requires special attention, please see me at my office & contact the University's Disability Resources for Student Office (448 Schmitz, 206.543.8924, TTY 543.8925, uwdss@u.washington.edu). The Disability Resources for Students has a website at http://www.washington.edu/students/drs.

Course Outline (subject to minor changes)

Week 1 - Principles of remote sensing & hyperspatial image analysis
- Week 1 Review
- Lab 1: Image interpretation & validation of aerial & satellite imagery using LACO-wiki from Geo-Wiki

Week 2 - High resolution imagery, georeferencing, & spatial portals
- Week 2 Review
- Lab 2: Importing aerial photography & temporal analysis in Google Earth

Week 3 - Examples of remote sensing & image measurements & calculations
- Week 3 Review
- Lab 3: Working with hard copy & digital aerial photography

Week 4 - Examples cont'd & image analysis, manipulation & segmentation
- Week 4 Review
- Lab 4: Digital image analysis

Week 5 - Midterm
- Midterm
- Lab 5: Introduction to computer aided image segmentation

Week 6 - Accuracy assessment & historical change detection
- Week 6 Review
- Lab 6: Historical change detection & accuracy assessment

Week 7 - Pattern recognition, image segmentation & PhoDAR
- Week 7 Review
- Lab 7: Structure from motion (SfM) & creating 3D point clouds from photographs

Week 8 - LiDAR Part I
- Week 8 Review
- Lab 8: Introduction to LiDAR analysis
- Lab 9: Advanced LiDAR data analysis & GIS integration

Week 9 - LiDAR Part II
- Week 9 Review
- Lab 10: Final lab project (it's just a longer lab not an independent project)

Week 10 - New developments in remote sensing
- Week 10 & Final Review