Meeting Times:
M 12:35-1:55 PM ENR 237 (CRSSA Teaching Lab)
Th 12:35-1:55 PM ENR 123

Instructor:
Dave Smith
Email: dave.c.smith@rutgers.edu
Office: ENR 127

Course Website:
http://onlinelearning.rutgers.edu/ecollege

Course Objectives: students should learn the fundamentals of digital analysis, interpretation and application of satellite remotely sensed imagery. Students should develop an understanding of digital image processing techniques (including the basic data structures and algorithms involved) and become proficient in the hands-on application of these techniques using the ERDAS image processing workstations. Students should learn not just how but also why and when to apply digital image processing techniques in the analysis of remotely sensed imagery.

Graduate students: additional journal articles on Sakai and on reserve at Chang

Jan 23 Lecture: INTRODUCTION TO SATELLITE IMAGE ANALYSIS
Web Lecture 1 & Supplemental: Image Data Acquisition
Homework 1: Ordering LANDSAT Images
Reading: Ch 1, 2, 3; ERDAS CH. 1, 3
Remote Sensing Applications article review handed out

Jan 27 Lab INTRO: Introduction to ERDAS IMAGINE and Graphical Modeler

Jan 30 Lecture: IMAGE DISPLAY AND ENHANCEMENT
Web Lecture 2 & Supplemental: Image Statistics
Homework 2: Image Statistics
Reading: CH 4, 5:151-164, 8:255-272; ERDAS Ch. 4, 6:141-157, ERDAS App A Math Topics

Feb 3 Lab 1: Image Segmentation

Feb 6 Lecture: IMAGE RESTORATION & ATMOSPHERIC CORRECTION
Web Lecture 3
Homework 3: Landsat TM Thermal IR Calibration
Reading: CH 6; ERDAS Ch. 5:132-135;

Feb 10 Lab 2: Image Normalization

Feb 13 Lecture: IMAGE RECTIFICATION
Web Lecture 4 & Supplemental: Cartography and Map Projections
Homework 4: Geometric Correction
Reading: CH 7; ERDAS CH 10, 13, App. B
Feb 17  Lab 3: Geometric Correction  
  Homework 4: Geometric Correction  
  Reading: CH 7; ERDAS CH 10, 13, App. B

Feb 20  Lecture: SPATIAL ENHANCEMENT/FILTERING  
  Web Lecture 5  
  Homework 5: Spatial Filtering  
  Reading: CH 8:276-329; ERDAS Ch. 6:157-160, 189-201  
  REMOTE SENSING APPLICATIONS ARTICLE REVIEW DUE

Feb 24  Lab 4: Spatial Enhancement  
  Homework 5: Spatial Filtering  
  Reading: CH 8:276-329; ERDAS Ch. 6:157-160, 189-201

Feb 27  Lecture: MULTI-IMAGE MANIPULATION  
  Web Lecture 6  
  Homework 6: Principal Components Analysis  
  Reading: CH 5:164-169, 8:274-276, 296-301; CH 11:443-445; Field Guide CH 6:162-183  
  TAKE-HOME EXAM DISTRIBUTED (Due Thursday Mar 13)

Mar 3  Lab 5: Principal Components Analysis

Mar 6  Lecture: IMAGE CLASSIFICATION: UNSUPERVISED CLASSIFICATION  
  Web Lecture 7  
  Homework 7: Spectral Clustering  
  Reading: CH 9:379-389; Field Guide CH 7:221-225, 231-235

Mar 10  Lab 6: Unsupervised Classification

Mar 13  Lecture: SUPERVISED CLASSIFICATION  
  Web Lecture 8  
  Homework 8: Supervised Classification Algorithms  
  Reading: CH 9:337-389; Field Guide CH 7:257-231, 235-253  
  TAKE-HOME EXAM DUE  
  GRADUATE STUDENTS: RESEARCH PROJECT PROPOSAL DUE

Mar 17 & 20  Spring Break

Mar 24  Lab 7: Supervised Classification

Mar 27  Lecture: CLASSIFICATION REDUX: ADVANCED METHODS  
  Web Lecture 9  
  Reading: CH 9:389-401, CH 10, CH 11:445-457  
  Return/Review take-home exam  
  GRADUATE STUDENTS: RESEARCH PROJECT OUTLINE DUE

Mar 31  Lab 8: Knowledge-based Classification

Apr 3  Lecture: ACCURACY ASSESSMENT  
  Web Lecture 10  
  Homework 9: Accuracy Assessment  
  Reading: CH 13, Field Guide CH 6
Remote Sensing

Spring 2014

Apr 7  Lab 9: Accuracy Assessment
Apr 10 Lecture: VEGETATION INDICES
             Web Lecture 11
             Homework 10
             Reading: CH 8:301-322, CH 11:431-443, 457-462
Apr 14 Lab 10: Vegetation Indices
Apr 17 Lecture: HYPERSPECTRAL REMOTE SENSING
             Web Lecture 12
             Reading: Field Guide CH 10-11
Apr 21 Lab 11: Hyperspectral Remote Sensing
Apr 24 Lecture: CHANGE DETECTION
             Web Lecture 13
             Reading: CH 12
Apr 28 Lab 12: NJ Change Detection
May  Lecture: FUTURE DIRECTIONS
             Web Lecture 14
May 5  Lab 13: Classification Project Work Day

May 5  CLASSIFICATION PROJECT DUE; PROJECT SYNTHESIS
       TAKE-HOME FINAL EXAM DISTRIBUTED

May 13 FINAL TAKE HOME EXAM: DUE 9AM

COURSEWORK EXPECTATIONS:

Reading assignments are expected to be read prior to the class date that is listed in the syllabus above. Students are expected and encouraged to ask questions concerning the reading assignments and lecture material. If you don't ask, I won't know you don't understand. Graduate students will meet every other week at a time to be decided in class.

Homework assignments have been designed to supplement the lecture material and give the student added preparation in some of the details. Homework will be distributed on Mondays and will be returned (completed) to your instructor the following Monday. Each homework assignment is generally worth 3 points: 0 - not completed; 1 - unsatisfactory; 2 - satisfactory; 3 - excellent. Late homework will be downgraded by 1 point.

Lab assignments are hands-on exercises using the ERDAS image processing work stations. During lab periods, students will work in groups (of 2) to complete the exercises. Interaction between students and the professor is expected and encouraged. Students are encouraged to work in the CRSSA teaching lab, alone or with other class members, outside of normal class periods. Don't let your lab partner do
everything - students are expected to develop the proficiency to work unassisted on the ERDAS systems. There will be six lab assignments (5 pts each) during the first half of the semester. Graduate students will have a major cumulative lab assignment during the second half (worth 50 points).

There will be a take-home exam and a final exam. These exams will be on the material covered in lecture, lab and the reading. There will be a literature research paper due during the first half of the semester focusing on RS applications. There are a series of extra readings for graduate students; we will meet biweekly to discuss.

There will be a final project incorporating hands-on image classification and/or change detection and/or RS/GIS integration, etc. The work to complete the project will be done outside of normal class meeting times. Each student is expected to work independently. You can confer with other students on different approaches, techniques used, etc., but the final results and project write-up should be your own. A separate handout concerning the project will be distributed later in the semester.

The CRSSA teaching lab is open 5 days a week (Monday to Friday) from 8:30AM to 6PM. Additional weeknight and weekend hours will be posted. You will only be able to work on the ERDAS Image Processing systems during CRSSA’s normal posted hours (check www.crssa.rutgers.edu/help/lab_sched_html). No eating or drinking is allowed in the lab.

GRADING:

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<tr>
<th>Grade</th>
<th>Points</th>
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<tr>
<td>A</td>
<td>90-100</td>
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<td>B</td>
<td>80-89</td>
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<td>C</td>
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<td>D</td>
<td>60-69</td>
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<td>F</td>
<td>Below 60</td>
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Grading Scale is quite standard; though there may be some scaling, use the following as a guide.