Advanced Remote Sensing (GEOG 473/582) – Course Syllabus

New Mexico State University
Department of Geography

Spring 2019

Lecture: Tue & Thu, 15:00-16:15; Breland Hall 192
Lab M01: Thu, 9:30-12:00; Breland Hall 192
Lab M02: Mon, 14:00-16:30; Breland Hall 192

Instructor Information

Dr. Michaela Buenemann (Professor)
- Office: NMSU Main Campus, Breland Hall 139
- Email: elabuen@nmsu.edu
- Phone: (575) 646-6493
- Advising Hours: Tue, 13:00-14:45; Wed, 9:00-12:00 & 13:00-15:00; Thu, 13:00-14:45; by appointment. To ensure my time is all yours when we meet, either in person in Breland Hall 139 or via Adobe Connect in Canvas, please sign up for an advising session).
- Response time: 1 business day to email; 3 business days to phone calls

Scott Miller (Teaching Assistant)
- Office: NMSU Main Campus, Breland Hall 144
- Email: scott217@nmsu.edu
- Phone: (575) 646-4156
- Advising Hours: Mon, 11:00-12:00; Wed, 13:00-14:00; Thu, 14:00-15:00; by appointment; in person in Breland Hall 144 or via Adobe Connect in Canvas
- Response time: 1 business day to email; 3 business days to phone calls

Course Introduction

Course Description
Building on the fundamental remote sensing concepts, techniques, and applications introduced in the Introduction to Remote Sensing (GEOG 373/573), this course aims at familiarizing you with advanced topics in digital remote sensing applications, image evaluation, preprocessing, analysis, interpretation, and visualization. Specific topics include, but are not limited to, geometric and radiometric correction, field spectroscopy, image enhancement, image classification, change detection, accuracy assessment. The course includes a lecture and lab component, both of which are student-centered and thus highly interactive.

Student Learning Outcomes

Upon completion of this course, you should be able to:
1. explain basic and advanced remote sensing concepts and methods;
2. acquire, evaluate, and preprocess raw remote sensing images;
3. produce a series of image-derived indices and transformations;
4. calibrate and evaluate various remote sensing image classifications; and
5. perform digital change detection of remotely sensed data.

Course Structure

This is a fast-paced course with a steep learning curve: the course introduces a variety of interrelated advanced remote sensing concepts and methods. The major topics are treated somewhat separately in each of the chapters in your textbook as well as during the lectures and labs. However, the power of remote sensing can only be fully appreciated and exploited by synthesis and integration of the many topics discussed throughout the semester. An understanding of topics treated during the third week of class demands an understanding of the topics treated during the first and second weeks of class, and so forth. Similarly, remote sensing studies typically involve a series of interlinked processing steps, beginning with those discussed during the first few weeks of the semester and concluding with those discussed during the last few weeks of the semester. It is thus crucial that you always keep up with the readings, discussions, and assignments.

Course Materials

Textbook

You need to acquire a textbook for this course and have three options concerning the book itself: you buy/rent 1) the required text (**Jensen, J. R. 2016. Introductory Digital Image Processing. 4th edition. Glenview, IL: Pearson**), 2) an earlier edition of the text, or 3) any advanced remote sensing book of your own choice. If you choose a book other than the required book, you are responsible for correlating the content of your chosen book with the required reading assignments. Note that you may be able to check out the book from a library and that you may be able to purchase the book for discounted prices at used bookstores, thrift stores, or online at amazon.com, barnesandnoble.com, or textbookland.com. In addition to this textbook, we expect you to prepare some journal articles (available via Canvas) for class discussions later in the semester. Optional readings include and are not limited to the required book for GEOG 373/573 (Jensen, J. R. 2006. *Remote Sensing of the Environment: An Earth Resource Perspective*. 2/E ed. Upper Saddle River, NJ: Prentice-Hall).

Lab Manual

There is no formal lab manual for this class. All lab assignments will be made available for you on Canvas and Mapper.

Software

We will use ENVI software in the lab component of the course. ENVI is available on all computers in the geography lab room. In addition, to give you maximum flexibility in completing the labs, we will provide you with instructions for using ENVI on your PCs.

Communication

Canvas Course Management System Website

Materials for this course (e.g., lectures, labs, grades) can be found at https://learn.nmsu.edu/. To access course materials, simply log in to your Canvas account and click the link for this course. The website is a key element of this course and you are required to review its contents regularly. If you encounter problems related to the website, please contact us immediately.

E-mail and Canvas Messages

You can reach us at the NMSU email addresses provided under Instructor Information above or via Canvas Messages. Note that your NMSU email account is the official means of communicating with the university. Information critical to your success at NMSU is delivered to you via this account, and you are expected to follow rules and policies provided to you via this communication method. Any email from you to us should be sent either through your official NMSU email account or through Canvas Messages. Please be advised that due to privacy and security concerns, we are unable to respond to emails from or about students that do not originate from an official NMSU email address. Unless we are away from the office with limited access to email, we will respond to your messages within one business day. Similarly, we expect you to respond to our emails in a timely manner. So, please access your NMSU email and Canvas accounts frequently.

Announcements

We will use the Announcements tool in Canvas to send time sensitive and regular information to the entire class. To ensure you receive this information the moment it is posted, set your notification preferences in Canvas to "right away". To do so, in Canvas, go to Profile > Notifications > Announcements and change the setting "Notify me right away."

Advising Hours

Our advising hours are provided under Instructor Information above. During these hours, we will be available in person in our offices or online in our Adobe Connect rooms as noted under Instructor Information above. To meet with Dr. Buenemann, sign up for an advising session with her prior to the meeting. If none of her advising hours work for you, please email her to set up an appointment during an alternative time. To meet with the TA, simply drop by his physical or virtual offices during their office hours or a pre-arranged time.

Phone calls

Phone calls are not out preferred mode of communication and our response times to voice messages may be up to three business days. Our phone numbers are provided under Instructor Information above.

Expectations

What You Can Expect From Us

We will be available to you during our advising hours and scheduled appointments as well as via NMSU email and Canvas messages. Don't be shy and contact us as soon as ambiguities,

problems, or worries arise. We will take all of your questions, comments, and concerns seriously and respond to you as promptly and as specifically as possible. We will do our very best to provide you with a high-quality learning experience, grade assignments fairly, and offer feedback on your work within one week of turning it in. We reserve the right to make changes to course materials, assignments, and policies to better accommodate your learning needs. Any changes made will be published as soon as possible via Canvas Announcements and will not adversely affect your workload or grade. We encourage each of you to be both teacher and learner in this course. To that end, we like to encourage interactions among participants and do not wish to be "sages on the stage."

What We Expect From Ourselves and You

Enrollment in this course and acceptance of this syllabus is your contract constituting acceptance of all NMSU policies and codes as well as all specific guidelines outlined in this syllabus. We will do our very best to facilitate learning (i.e., to help you achieve the Course Learning Outcomes stated above)—we will always prepare and present class materials to the best of our abilities; give you tasks that will help you better understand key concepts and methods; and encourage cooperative, student-centered learning. You are responsible for learning itself.

Grading Policy

Grade Components and Weights

Your final course grade will be based on the points you earn on the following assignments.

Exams (× 4):	240 points	24%	
Labs (× 12):	360 points	36%	
MCPs (× 10):	50 points	5%	
iRATs (× 10):	100 points	10%	**1,000 Points (100%)**
tRATs (× 10):	200 points	20%	
In-Class Activities (× 10):	50 points	5%	

Graduate Students: Upon completion of this course, the number of points listed above for undergraduate students will be adjusted to account for only 80 % of your final grade. You will earn the remaining 20% of your final grade through completion of additional projects.

Grading Scale

Your final course letter grade will be based on the following fractional scale.

A (4.0)	95-100%	**B (3.0)**	84-86%	**C (2.0)**	74-76%	**D (1.0)**	64-66%
A- (3.7)	90-94%	**B- (2.7)**	80-83%	**C- (2.0)**	70-73%	**D- (1.0)**	60-63%
B+ (3.3)	87-89%	**C+ (2.3)**	77-79%	**D+ (1.0)**	67-69%	**F (0)**	< 60%

Assignments and Criteria

Exams: There will be four exams. Exams 1, 2, 3, and 4 will account for 5% (50 points), 4% (40 points), 5% (50 points), and 10% (100 points) of your final course grade, respectively, and thus for a combined total of **24%** (240 points) of your final course grade. Each exam will be cumulative, assessing your learning since the beginning of the semester. All other exams will be written on paper and in class on the exam days indicated in the Tentative Course Outline below. All exams will be individual efforts. **Make-up exams:** If you have a legitimate excuse for a

university-sanctioned activity or work-related event that will cause you to miss an exam, contact us prior to the official exam time so that we can schedule a make-up exam, and provide us with written documentation prior to or on the day of your make-up exam. If you have to miss an exam due to illness, contact us as soon as possible so that we can schedule a make-up exam, and provide us with written documentation on the day of the exam. If you fail to follow these guidelines or if you miss an exam for other reasons, you will receive 0 points for the exam.

Labs: There will be twelve lab exercises, each accounting for 3% (30 points) of your final grade or for a combined total of **36%** (360 points). The labs will thus be crucial to your overall success in this course. The labs are designed to help you learn how to apply concepts and techniques introduced in class. Labs will be graded based on the quality with which you completed all lab tasks (i.e., each task is worth a certain number of points and you earn no, partial, or full credit depending on the completeness and correctness of your work). We invite you to collaborate with others to solve lab problems, but your lab submissions must clearly be your own work. All labs are required to earn the maximum number of points in this course (i.e., 1,000 points).

Muddy & Clear Points (MCPs): MCPs are written notes summarizing aspects of the readings that were unclear and aspects of the readings that made perfect sense to you. There will be ten MCPs this semester, each accounting for 0.5% (5 points) of your final grade. Collectively, the MCPs will thus determine **5%** (50 points) of your final course grade. MCPs are credit opportunities for you to reflect on your understanding of the class materials. They should serve as another incentive for you to prepare the readings for class. At the same time, they allow us to tailor each class meeting specifically to your needs, with emphasis on muddy points and no or only short discussions of clear points. MCPs must be completed individually and turned in via Canvas by the beginning of class on the days indicated in the Tentative Course Outline below.

Readiness Assessment Tests (**RATs):** Many **Learning Outcomes** (**LOs**; i.e., descriptions of things you should be able to do) could be formulated for each lecture, but some are particularly crucial to help you acquire the five overall LOs of this course (p. 1). To help you stay focused on the important issues, we will provide you with a set of "crucial LOs" (i.e., **study guide**) for all major topics and assess the degree to which you have acquired these LOs in the form of both **individual RATs (iRATs)** and **team RATs (tRATs)**. iRATs must be completed individually and turned in via Canvas by the beginning of class on the days indicated in the Tentative Course Outline below; tRATs will be completed by teams in class and are to be submitted via email to Dr. B. upon completion. As indicated in the Tentative Course Outline below, the RATs initially cover new material, i.e., material you are asked to prepare for class and thus material we don't expect you to fully understand right away. The reason for giving you these early RATs is twofold: they give you an incentive for preparing for class and us an idea of what you do or do not understand and, hence, what we should focus on in the lectures. Once we have received your initial iRATs and tRATs, we will provide you with feedback for improving the tRATs and invite you (not require you) to revise and resubmit them (tRATs only, not iRATs) for a potentially higher grade. There will be ten iRATs, each accounting for 1% (10 points) of your final course grade or for a combined total of **10%** (100 points), as well as ten tRATs, each accounting for 2% (20 points) of your final course grade or for a combined total of **20%** (200 points).

In-Class Activities: In-class participation is crucial for you to learn, and we will provide you with many in-class opportunities to do just that. By actively participating in these opportunities, you may earn 50 points (**5%**) of your final course grade. All in-class tasks will be completed in teams in class and are to be submitted via email to Dr. B. upon completion.

Teams & Peer Evaluations: Collaboration is an important component of most jobs and tends to be very rewarding. We thus encourage collaboration throughout the semester. To facilitate the process, you will be divided into teams, each comprised of about four students. Each team will be made up of a diversity of individuals, but different teams will be comparable to each other (e.g., each team will be composed of roughly the same number of geography and non-geography majors). Members of every individual team will complete tRATs and In-Class Activities as just that—a team. However, while each team member will initially receive the same grades as all other team members, adjustments of each team member's grades (upward or downward) will be made based on peer evaluations that assess an individual's contribution to the success of the team (e.g., preparedness, reliability, participation in discussions, ability to compromise). It is thus in your own best interest to always be prepared and contribute as much as possible to teamwork and discussions.

Grades & Written Appeals: If you have any issues with a graded test, exam, lab, etc. (e.g., you feel a task was ambiguous and thus impossible to answer correctly or you feel your answer was correct and not ours), you and/or your team may prepare a written appeal and submit it to us. If we feel that your appeal has merit, you will be given credit accordingly.

Additional Requirements for Grad Students: Grad students will be required to submit a term project as part of their course work (20% of final grade). Guidelines for the term project will be outlined in a separate document. If you are a grad student, please contact me ASAP for details.

Further details regarding each of the above grade components will be provided to you in class, lab, and/or on the course website.

Curving of Grades

Individual assignments and tests will not be curved (↑ or ↓). We *may* make adjustments of the final letter grade after an assessment of the class curve at the end of the term. We consider class participation, attendance, and improvement over the term as justification for discounting a grade that is uncharacteristically lower than others.

Grades on Canvas

You may use Canvas to keep track of grades that you earned for specific activities (e.g., an exam or a lab) as an individual or as part of a team. However, do not use summary grades in Canvas to assess your overall class performance as these grades are inaccurate. As described above, your team grades will be adjusted upward or downward based on peer evaluations, which Canvas does not take into account. To help you keep track of your actual overall grade, use the Excel spreadsheet on Canvas.

Incomplete Grades

An I (Incomplete) grade will be assigned only if you are unable to complete the course due to circumstances beyond your control (e.g., documented illness or documented death or crisis in your immediate family) that develop after the last day to withdraw from the course. Job-related circumstances are generally not appropriate grounds for assigning an I. An I grade will not be used to avoid assigning of D, F, U, or RR grades for marginal or failing work.

Late Work

Work not received by the deadline will not be graded and given 0 points, except in unusual

circumstances. We have three major reasons for not accepting late work. First, it is difficult to keep up with students who turn things in late and determine just how much to dock an assignment. Our time is better spent on improving course materials and providing better feedback. Second, there will be no confusion concerning when assignments are due. Third, imposing hard deadlines will prepare you for the real world. To ensure you meet all deadlines, allow extra time for glitches in computer hardware and software, internet connectivity, etc.; i.e., start working on assignments early and try to submit them ahead of time. If you are unable to submit your work on time due to extenuating circumstances, please discuss the situation with us well before anything is due so that we can develop solutions that support you.

Attendance

Absences need to be excused on exam days only. Absences due to University-sanctioned activities, work-related events, holidays or special events observed by organized religions, or illness will be excused, if you provide us with official written documentation explaining your absence. We don't have any additional attendance policies. Just keep the following in mind: learning is your responsibility and, if you miss a lecture or lab, you will have to figure out how to "make it up;" your peers will evaluate you in terms of your contributions to the success of your team and the class and these evaluations will be used to convert team grades to individual grades.

Class Withdrawals

Withdrawal from this course is solely your responsibility; we will not drop you from this class under any circumstances. If you no longer wish to be enrolled in this course, you must withdraw from it. If you are still on the class roll at the end of the semester, you will receive a grade based on the work submitted.

Academic and Non-Academic Integrity

Enrollment in this course and acceptance of this syllabus is your contract constituting acceptance of all University policies regarding academic and non-academic integrity. You are expected to comply fully with the NMSU Student Code of Conduct, which defines academic misconduct, non-academic misconduct, and the consequences or penalties for each. The Student Code of Conduct is available in the NMSU Student Handbook. Students who are judged to be guilty of academic misconduct, which includes cheating, plagiarism, and other forms of academic dishonesty, will be reported as required by NMSU policy.

Student Support

NMSU is committed to ensuring all students have the support they need to be successful and expand their educational horizons.

Academic Learner Services Support

- Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADAAA) covers issues relating to disability and accommodations. If you have questions or need an accommodation in the classroom (all medical information is treated confidentially), contact: Trudy Luken, Director; Student Accessibility Services (SAS), Corbett Center Student Union Room 208; Phone: (575) 646-6840; E-mail.
- NMSU, in compliance with applicable laws and in furtherance of its commitment to

fostering an environment that welcomes and embraces diversity, does not discriminate on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex (including pregnancy), sexual orientation, spousal affiliation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Inquiries may be directed to the Laura Castille, Executive Director, Title IX and Section 504 Coordinator, Office of Institutional Equity (OIE), P.O. Box 30001, 1130 E University Avenue, Las Cruces, NM 88003; Phone: (575) 646 3635; TTY: (575) 646 7802 (TTY); E-mail.

- Title IX prohibits sex harassment, sexual assault, intimate partner violence, stalking, and retaliation. For more information on discrimination or Title IX, or to file a complaint, contact Laura Castille, Executive Director, Title IX and Section 504 Coordinator, Office of Institutional Equity (OIE), P.O. Box 30001, 1130 E University Avenue, Las Cruces, NM 88003; Phone: (575) 646 3635; TTY: (575) 646 7802 (TTY); E-mail.
- NMSU Police Department: (575) 646-3311
- NMSU Police Victim Services: (575) 646-3424
- NMSU Counseling Services: (575) 646-2731
- NMSU Dean of Students: (575) 646-1722
- For Any On-Campus Emergencies: 911

Student Support Services

- The Math Success Center provides students continuing support with math supplemental instruction, tutoring, and testing.
- The Writing Center offers free services to all NMSU students through one-on-one consultations at any stage in the writing process, from understanding assignment directions to revising final drafts. The Writing Center is staffed by graduate assistants who teach undergraduate writing courses in the English Department and offers online consultations for distant learners. Consultants advise students on aspects of proofreading and editing, but do not provide editing services.
- The NMSU Student Success Center offers a variety of programs and services, including Freshman Year Experience, Campus Tutoring Service, Learning & Study Skills Workshops, Peer, and TRIO Student Support Services. The Student Success Center also serves students through Career Services and Financial Literacy.
- The NMSU Center for Academic Advising and Student Support offers centralized advising for undergraduate students. We also encourage both undergraduate and graduate students to meet with faculty in the NMSU Department of Geography concerning any questions and concerns.
- NMSU Financial Aid and Scholarship Services offers timely and understandable information about financial aid and scholarship options to all students.
- The NMSU Registrar's Office supports all students at NMSU; registering for classes at NMSU requires three steps: academic advising, registering for classes, and paying the tuition and fee bill.
- Other resources for NMSU students include tutoring services, the library, career services, the Aggie Health and Wellness Center, and more. Numerous webpages provide information on distance education for online students.

Technical Support

The ICT Customer Service Center is equipped to deal with all of your information technology (IT) and telecommunications needs at NMSU. The ICT Customer Service Center hours of operation are from 8:00 am until 5:00 pm Monday through Friday Mountain Time. Please feel free to contact them at (575) 646-1840 or via e-mail. You can also go to the Student Technology Help web page and Student Resources located at the Canvas web page for additional information on Canvas. For assistance with ArcGIS, contact your TA or Dr. Buenemann as described above.

Important Dates

You may add courses through Thursday, 17 January 2019 without instructor permission and through Monday, 28 January 2019 with instructor permission. Late registration fees will apply for courses added after Wednesday, 16 January 2019. The deadlines for dropping this course without and with a "W" are Friday, 1 February 2019, and Friday 15 March 2019, respectively. You may withdraw from the university (withdraw from all classes) through Friday, 3 May 2019.

Syllabus Modifications Statement

We reserve the right to make changes to course materials, assignments, and policies to better accommodate your learning needs. Any changes made will be published as soon as possible via Canvas Announcements and will not adversely affect your workload or grade. For the most recent version of the syllabus, always consult Canvas.

Tentative Course Outline

Week	Date	Topic	Due: At Home | In Class * Pages in Jensen 2005
PART I: IMAGE PREPROCESSING & ENHANCEMENT			
1	01/17	**Welcome & Ice Breakers** Introductions, Teams, Etc.	✓ Study Syllabus & Get Textbook
2	01/22	**Fundamentals of Remote Sensing (1)** Remote Sensing Definition Remote Sensing Process	
	01/24	Resolution Considerations Remote Sensing Systems Visual Image Interpretation Elements	✓ Reading #1: 1-32, 37-108, 185-204 (Materials from RS Intro)* ✓ MCP #1 & iRAT #1 (Topic 1) ✓ tRAT #1 (Topic 1)
	Lab	*No Lab*	
3	01/29	Electromagnetic Radiation Principles Color on Remotely Sensed Imagery	
	01/31	**Data Visualization & Evaluation (2)** Hardware and Software Data Visualization Data Evaluation	✓ Reading #2: 111-130, 131-151, 153-181* ✓ MCP #2 & iRAT #2 (Topic 2) ✓ tRAT #2 (Topic 2)

			✓ Revision of tRAT #1
	Lab	*Lab #1: Getting Started with ENVI*	
4	02/05	**Radiometric Correction (3)** Correction of Systematic Errors Absolute Radiometric Correction	✓ Reading #3: 205-232* ✓ MCP #3 & iRAT #3 (Topic 3) ✓ tRAT #3 (Topic 3) ✓ Revision of tRAT #2
	02/07	Relative Radiometric Correction Peer Evaluation #1	
	Lab	*Lab #2: Data Viz and Evaluation*	✓ Lab #1
5	02/12	**Geometric Correction (4)** Geometric Errors	✓ Reading #4: 235-271* ✓ MCP #4 & iRAT #4 (Topic 4) ✓ tRAT #4 (Topic 4) ✓ Revision of tRAT#3
	02/14	Spatial Interpolation Intensity Interpolation	
	Lab	*Lab #3: Radiometric Correction*	✓ Lab #2
6	02/19	**Exam #1 (Topics 1-4)**	✓ Prepare for Exam #1
	02/21	**Image Derivatives (5)** Spatial profiles Spectral profiles Contrast enhancements	
	Lab	*Lab #4: Geometric Correction*	✓ Lab #3
7	02/26	Spatial filtering Texture transformations	✓ Reading #5: 273-353* ✓ MCP #5 & iRAT #5 (Topic 5) ✓ tRAT #5 (Topic 5) ✓ Revision of tRAT#4
	02/28	Band ratios Principal components analysis	
	Lab	*Lab #5: Image Derivatives I*	✓ Lab #4
8	03/05	Vegetation indices Landscape Ecology Metrics	
8	03/07	**Exam #2 (Topics 1-5)**	✓ Prepare for Exam #2
	Lab	*Lab #6: Image Derivatives II*	✓ Lab #5
PART II: IMAGE CLASSIFICATION & CHANGE DETECTION			
9	03/12	**Thematic Information Extraction: Introduction (6)** Introduction to Image Classification Feature Selection Peer Evaluation #2	✓ Reading #6: 361-393, 557-580* ✓ MCP #6 & iRAT #6 (Topic 6) ✓ tRAT #6 (Topic 6) ✓ Revision of tRAT#5
	03/14	Calibration of Classification Models Evaluation of Classification Models	

	Lab	*Lab #7: Image Derivatives III*	✓ Lab #6
10	03/19	**Information Extraction using Traditional Classifiers (7)** Traditional Unsupervised Classifiers	✓ Reading #7: 393-423* ✓ MCP #7 & iRAT #7 (Topic 7) ✓ tRAT #7 (Topic 7) ✓ Revision of tRAT #6
	03/21	Traditional Supervised Classifiers	
	Lab	*Lab #8: Classification Scheme & Reference Data Collection*	✓ Lab #7
11	---	*Spring Break (03/25-03/29): No Lectures, No Labs*	
12	04/02	**Information Extraction using Artificial Intelligence (8)** Decision Trees & Regression Trees Support Vector Machines Neural Networks	✓ Reading #8: 430-453* & TBA ✓ MCP #8 & iRAT #8 (Topic 8) ✓ tRAT #8 (Topic 8) ✓ Revision of tRAT #7
	04/04	Etc.	
	Lab	*Lab #9: Classification using Traditional Classifiers*	✓ Lab #8
13	04/09	**Change Detection (9)** Change Detection Considerations Change Detection Steps Change Detection Algorithms	✓ Reading #9: 501-551* ✓ MCP #9 & iRAT #9 (Topic 9) ✓ tRAT #9 (Topic 9) ✓ Revision of tRAT #8
	04/11	**Exam #3 (Topics 1-8)**	✓ Prepare for Exam #3
	Lab	*Lab #10: Classification using AI Classifiers*	✓ Lab #9
PART III: MORE ADVANCED TOPICS			
14	04/16	**Remote Sensing Models and Advanced Image Analysis (10)** Remote Sensing Models	✓ Reading #10: 459-496* & Strahler, Woodcock, and Smith 1986 & TBD ✓ MCP #10 & iRAT #10 (Topic 10) ✓ tRAT #10 (Topic 10) ✓ Revision of tRAT #9
	04/18	Imaging Spectroscopy	
	Lab	*Lab #11: Change Detection*	✓ Lab #10
15	04/23	Field Spectroscopy	✓ Revision of tRAT #10
	04/25	Spectral Mixture Analysis	✓ Reading TBD
	Lab	*Lab #12:*	✓ Lab #11
16	04/30	Object-Based Image Analysis	✓ Reading TBD
	05/02	Wrapping Things Up …	
	Lab	*Lab: Wrapping Things Up …*	✓ Lab #12
17	**05/09**	**Final Exam (All Topics): 15:30-17:30** Peer Evaluation #3	✓ Prepare for Final Exam