GEOPHYSICS 4336/5335: Introduction to Remote Sensing
CRNs: 18299/18298

The University of Texas at El Paso   Department of Geological Sciences
Fall Semester 2020

Instructor: **TA:**

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Note: Please only use the internal email system to Blackboard to communicate with the instructors (see below)

Course Description, Objectives, and Expected Learning Outcomes:

The goal of this course is for the student to attain a firm understanding of the physics and basic principles of remote sensing. The emphasis in this course will be on basic concepts, and there will be mathematical treatments electromagnetism, statistical physics, physical chemistry, optics, orbital mechanics, and photogrammetry, among other topics. Other topics will include the spectral characteristics of biological and geological materials, sensor system design, image acquisition and processing, and applications of remote sensing to the Earth and planetary sciences. Students will be given access to state-of-the-art computer facilities, instruction on how to use the popular image processing software ENVI, experience with Google Earth Engine, and exposure to a variety of remotely sensed datasets including aerial photographs, satellite-based optical imagery (e.g. Landsat, SPOT, ASTER, IKONOS, etc.), LIDAR, and RADAR. Note that this course is intended to prepare the student for Geophysics 5336 (Digital Image Processing) and for doing research using remote sensing and digital image processing concepts and methods.

Grading:

~10 laboratory/homework assignments (60%); 1 midterm examination (15%), 1 final examination (15%); participation (10%).

Grades will be computed based on the above percentage breakdown applied to the total number of points computed at the end of the semester. Each graded item (assignment, exam, quiz, etc.) will have an assigned point value that may vary from item to item. Every graded item will have an associated rubric that will be used for evaluating it and assigning points. The rubric will have crucial information that could affect your grade for each activity. You will find these rubrics by clicking on the appropriate assignment link in Blackboard.

Your participation will, in part, be evaluated based on weekly quizzes, weekly posts made to the Blackboard discussion forums, etc. Discussion forum posts and responses will have specific requirements, to include your post as well as replies to at least two others. Some extra credit points from assignments, quizzes, etc. may be made available.

Graduate students will be held to a higher standard than undergraduates (and Ph.D students held to a higher standard than M.S. students). For example, selected homework assignments/problems/tasks and selected exam problems may be designated as required for graduate students and extra credit for undergraduates, etc.. Graduate students may also be expected to lead online discussions and/or be assigned additional tasks. Generally, there will be the expectation of more in-depth/detailed/higher-quality work from graduate students commensurate with their academic level.

Class Meetings:
The lecture and lab components of this course will both be entirely online and largely asynchronous, but will proceed on a weekly schedule (i.e. not at your own pace). We will not meet face-to-face at any time this semester (disregard any scheduled on-campus meetings listed in Goldmine). Note, however, that we may try to meet online synchronously as an entire class once or twice during the semester. If we do, it will occur during a M or W 10:30 am-12:20 pm timeslot. These meetings will be required, and you will be notified of them ahead of time.

Office Hours:
Dr. Hurtado and the TA will each host their own, live virtual office hours on Blackboard Collaborate videochat at least once per week (see schedule below). Generally, your attendance at these will not be required, but you are strongly encouraged to participate so that you can stay engaged with the class and get help with the lab assignments and/or any material presented in the lectures.
Dr. Hurtado: M and W 11 am -12 pm, or by appointment
Derek: F 11 am – 12 pm
Alex: Th 1 pm – 2 pm

Communication

Method	Response Time	Notes
Blackboard Announcements	--	Be sure to check Blackboard regularly for updates, deadlines, and other important messages. Blackboard is available on the web and also as a mobile app.
Blackboard Discussion Forum	Within <24 hours for replies to posts	Posts are visible to the instructors and the whole class. There are dedicated forums for technical help, general help, fun posts, as well as specific

		assignments.
Blackboard Collaborate	See above for scheduled sessions New appointments available within 24-48 hours	Schedule new appointments via Blackboard email. Scheduled office hours are in a group setting. Private conversations are possible on request/by appointment.
Microsoft Teams (or Zoom)	--	Will only be used as backup alternatives to Blackboard Collaborate
Email (**do not use UTEP webmail, etc; use Blackboard internal email only please**)	Within <6 hours	For direct, confidential contact with instructors, this is the preferred method. Please always include the course name as the subject line, state your message clearly, etc.
Cell Phone (see numbers above)	Within <3 hours	Monday to Friday: 10am-6pm Weekend: emergencies only. Please leave voice mail. No texts, please.
Office Phone (see numbers above)	Within <24 hours	Instructors will be remote working so cell phone is preferred. Please leave voice mail.

Class Online Materials:

Check the Blackboard portal for this course often for updates and announcements. The online materials are the key part of the class and Blackboard will be the main venue all class business. Note that there is a single, merged Blackboard portal for both GEOP 4336 and GEOP 5335, which will be the only portal we will use. The course is designed around weekly modules, each of which includes learning content to include "lecture" notes, videos, PDF readings, weblinks, assignments (labs, homeworks, discussions), and quizzes. These modules will be released to Blackboard weekly.

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

Text:

Useful, **but not required**, books include:

John R. Jensen, 2007, *Remote Sensing of the Environment: An Earth Resource Perspective* (2nd edition): Pearson/Prentice Hall, 608 pp.; ISBN 0131889508.

John R. Jensen, 2005, *Introductory Digital Image Processing: A Remote Sensing Perspective* (3rd edition): Pearson/Prentice Hall, 526 pp.; ISBN 0131453610.

Excerpts from these and other texts, as well as supplemental materials from a variety of other sources, will be provided throughout the semester. These

resources will be posted on the class Blackboard portal and will be continually updated throughout the semester.

In addition, the documentation for Python, JavaScript, Google Earth Engine, MATLAB, ENVI, and other software we will use will be critical resources during the semester. The following websites will also be good resources:

- The Remote Sensing Tutorial: https://geoinfo.amu.edu.pl/wpk/rst/rst/Front/tofc.html
- NRC Remote Sensing Tutorials: https://www.nrcan.gc.ca/maps-tools-publications/satellite-imagery-air-photos/tutorial-fundamentals-remote-sensing/9309
- The Remote Sensing Core Curriculum: https://rscc.umn.edu/
- USGS Spectroscopy Laboratory: https://www.usgs.gov/labs/spec-lab
- Google Earth Engine Developers Page: https://developers.google.com/earth-engine

Required Information Technology Tools and Resources:

To fully engage in and complete the work for this course, everyone will individually need to have daily access to a reliable, preferably broadband, internet connection, ideally on a laptop or a desktop computer equipped with a camera and microphone and a selection of software (see below). Check that your computer hardware and software are up-to-date and are able to access all parts of the course.

All students will be expected to have access to the following information technology, software, tools, and resources:

1. *Microsoft Office* (Word, Excel, and PowerPoint) or equivalent productivity software (e.g. Google Docs, etc.). This will be used to write reports, analyze data, make illustrations, etc. for assignments.
2. *Microsoft Paint* (or your favorite other image viewing/editing software, e.g. GIMP, Adobe Photoshop, Inkscape, Adobe Illustrator, etc.). This will be used to make/view illustrations.
3. *Adobe Reader* (or your favorite other PDF viewer). This will be used to view PDF documents posted by the instructors.
4. *Windows Media Player, QuickTime Player, VLC or equivalent video player.* This will be used to view video files.
5. *Access to your UTEP email account*. We may need to communicate via external email throughout the semester. Note, however, that the primary means of email communication will be through the Blackboard internal email function.
6. *Access to Blackboard*. Please be sure to check that you have access to the Blackboard site for this course by the first day. We will use Blackboard as our primary means of communication (including email) and for all course business. In particular, we will make use of the Discussion Board and

Blackboard Collaborate. Please check that you can use both of these functions, as well as the Blackboard email system. **Mozilla FireFox and Google Chrome are the best-supported browsers for Blackboard.**

7. *Respondus.* See below for more information. This browser and associated software are used for exams. Be sure you have it installed on the device(s) you intend to use, and do so at the beginning of the semester. You can obtain Respondus through Blackboard.

8. *Access to the UTEP VPN* (see this link for more information https://www.utep.edu/technologysupport/ServiceCatalog/NET_VPNGlobalProtect.html). Connecting to the VPN will be necessary to access UTEP library resources and for running UTEP-licensed software (but not for Blackboard).

9. *ImageJ.* This venerable software is a simple, but powerful, image processing tool: https://imagej.nih.gov/ij/.

10. *ENVI.* This is an industry-leading package for remote sensing digital image processing. The software will be made available to you either in an on-campus lab or via remote log-in via the UTEP VPN (details TBD).

11. *Google Earth Engine (GEE).* If you are new to GEE, you must first create (or verify that you already have) a Google Gmail account. Then use that Gmail account to register for GEE access at https://earthengine.google.com/signup/. Once you are registered, you can log in as a GEE user to access all of the functionality of GEE. We will use GEE in the event ENVI is not available to us.

12. *MATLAB.* UTEP has a site license for this software and a large number of MATLAB toolboxes, including mapping, image processing, etc.: https://www.utep.edu/technologysupport/ServiceCatalog/SOFTWARE_PAGES/soft_matlab.html. GNU Octave is a largely compatible, free/open source alternative to MATLAB: https://www.gnu.org/software/octave/. We will use MATLAB in the event ENVI is not available to us.

13. Ability to install new software and/or access websites not specified here. As the semester progresses, you may be asked to install and use new software or other assets. Please let the instructors know if you have difficulty.

You will also be expected to stay continually up to date with all information posted on Blackboard, which will include the syllabus, course calendar/schedule, grades, announcements, email, discussion boards, video conferencing, course notes, readings, supplemental material, and assignments. All communications, including email, for the course will be exclusively via Blackboard. Also, all course materials will be disseminated electronically, and all work will be assigned and handed-in electronically via Blackboard only. No email or hardcopies will be accepted unless directed by the instructor.

Your continued enrollment in this course implies your acceptance of the policies set by the instructor!

That said, always keep off-line backups of any work you produce in the event of a problem with Blackboard. This way, you will have evidence that you completed the work and will not lose credit. Always submit your work with plenty of time to spare in the event that you have a technical issue with the Blackboard, the network, and/or your computer (see below).

As necessary, storage space, data, and additional software may be made available to you on the Geology Department computer system. To use the Department assets from off-campus, you will need to connect to the UTEP VPN first. Contact me AND the Geology Department system administrator, Carlos Montana (montana@utep.edu), if you have difficulties or any technical problems with Department resources and software. Carlos will be the one to fix things, but also I need to know what is going on.

If at any time you have problems accessing Blackboard, the internet, or any of the resources described here, or have any other technical difficulties, please reach out to the instructors ASAP. For troubleshooting, note that the Help Desk (https://www.utep.edu/technologysupport/) is trained specifically in assisting with technological needs of students.

Test Proctoring Software:
For the midterm and final examinations, we may make use of Respondus Lock Down Browser and Respondus Monitor inside of Blackboard to promote academic integrity. I will provide more details about this during the semester. You are also encouraged to learn more about how to use these programs. Please review the following guidelines:

- The assessments will only be available at the times identified on the course calendar.
- You may take the test at any time during the 24-hour window.
- A reliable Internet connection is essential to completing the exam. If you must go to a location to take the exam (such as the library), be sure to follow their health and safety requirements.
- You have 2 attempts to take the test. Once the window closes, your answers will be saved, and no changes can be made. The higher score will be recorded.
- Respondus Lockdown Browser will require that all internet tabs are closed prior to the start of the test.
- Respondus Monitor requires a webcam and microphone.
- You will be required to show the webcam your student ID prior to the start of the test.
- Your face should be completely visible during the test. Blocking the camera will disable the test.
- No notes or textbook materials are permitted during the test. Respondus Monitor requires you to take a video of your surrounding area (desk, chair, walls, etc.).

Your continued enrollment in this course implies your acceptance of the policies set by the instructor!

- You should not have conversations with other people and/or leave and return to the area during the test.

Class Recording Policies:

The use of recordings will enable you to have access to class lectures, group discussions, etc. in the event you miss any synchronous or in-person class meetings due to illness or other extenuating circumstances. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action.

Attendance and Engagement Policies:

Because of the asynchronous, remote, and independent nature of how most of this class is structured, it will be particularly important that every student maintain engagement. The onus will be on each one of you to make your own experience in the class a success. That means you need to **keep on schedule and on task from week-to-week,** including:

- staying in the loop on and being proactive about communication;
- participating in all discussions and other interactive activities;
- being diligent in reading/viewing all materials posted to Blackboard and making progress on assignments from week-to-week, e.g., for every hour of "class time" you should be devoting 3 hours to preparatory/study time and/or working on assignments. You are responsible for any and all material posted to Blackboard.
- not hesitating to ask questions about material posted to Blackboard, e.g. by emailing the instructors directly, posting questions to Blackboard, attending virtual office hours, etc.
- meeting deadlines and keeping your commitment to complete all work (major assignments and other graded work) and completing it on time.

Each one of the above items will contribute to how you will be evaluated for class participation/attendance. Your success in each of them will also contribute to high scores on your assignments and exams.

Late and Missing Work Policies:

Generally, the instructors will post new material (including assignments, readings, lectures, etc.) to Blackboard on Mondays by noon (11:59 am MT). Generally, you will have at least one week to do work (homework, labs, quizzes, discussion

board posts, etc.) which will due on Mondays no later than midnight (11:59 pm MT). **Due dates may change/vary, though, so be sure to read the instructions carefully.**

Unless other arrangements are made in advance, or you have a valid excuse (see below), **late work will lose up to 50% of its value for each day it is late, and work will not be accepted more than one week late.** In general, make-up exams and assignments will not be available unless in the case of a documented emergency, etc.. Note that any make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to the instructor, in advance if at all possible, and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

According to UTEP Curriculum and Classroom Policies: *"When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of "W" before the course drop deadline and with a grade of "F" after the course drop deadline."* See the UTEP Undergraduate Catalog for a list of excuse absences which include, but are not limited to, illness, absence with the instructor's prior approval, official University business, etc., but all require documentation. **Because you may be dropped from the course if you have excessive missing work or are not sufficiently engaged in the course, please contact Dr. Hurtado about any concerns, schedule conflicts, missing work, etc. ASAP and, whenever possible, in advance.**

Course Drop and Incomplete Grade Policies:

To drop this class, please contact the Registrar's Office (https://www.utep.edu/student-affairs/registrar/students/registration.html) to initiate the drop process. **If you cannot complete this course for whatever reason, please contact me. If you do not, you are at risk of receiving an "F" for the course.**

Incomplete grades may be requested/assigned only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines. If the deadlines are missed, the incomplete grade will automatically turn into an F.

Academic Dishonesty Policies:

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures (HOOP). It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials

during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. **Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. The University guidelines for academic dishonesty are very specific and will be strictly followed.** All suspected violations of academic integrity must be reported to the Office of Student Conduct and Conflict Resolution (https://www.utep.edu/student-affairs/osccr/) for possible disciplinary action. Refer to the UTEP HOOP (https://www.utep.edu/hoop/section-2/student-conduct-and-discipline.html), and the guidelines here (see https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html) for more information, and contact the Dean of Students or Dr. Hurtado if you have any concerns.

Some of your course work and assessments may submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

Note that this course may require you to work in groups at times and individually at other times. **Although reasonable collaboration will occur from time-to-time (on assignments, not exams), all work you turn for a grade in is expected to be your own!** You MUST learn to trust your own observations and interpretations (especially in the field) and NOT rely on those of others. This is your opportunity to learn the material and to hone your skills, so do not cheat yourself by copying the work of others. Show all your work and be prepared to explain it! Copying of other's work WILL be noticed and WILL NOT be tolerated.

Course Citizenship Policies:
This class will require interactions with your instructors and fellow students in an online, asynchronous environment. Think about your colleagues and your role in this group environment and in the current global circumstances. Collegiality, teamwork, and self-organization will make this class a great experience. Please consider the following guidelines as you interact with others online:

- Always consider your audience. Remember that members of the class and the instructors will be reading any postings.
- Respect and courtesy must be provided to classmates and to the instructors at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue, so all postings to it should be considered private and confidential. Whatever is posted on in these online

spaces is intended for classmates and the instructors only. Please do not copy documents and paste them to a publicly-accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

The instructors will be exercising other important leadership skills with you throughout the course, emphasizing good team behavior and dynamics.

SARS-CoV-2/COVID-19 Policies:

In light of the ongoing spread of SARS-CoV-2 virus and the pandemic of COVID-19, it has become necessary to develop and execute online alternatives to the face-to-face courses at UTEP. The intent of how I am organizing this course is to maintain the required social distancing. Note that if COVID-19 conditions deteriorate in the City of El Paso, all course and lab activities may be transitioned to remote delivery. Please follow the updates and guidance from UTEP (https://www.utep.edu/resuming-campus-operations) and from our Local, State, and Federal government in that regard during the ongoing crisis. If you have any difficulties or concerns related to the circumstances, please reach out to the instructors and/or take advantage of the student support resources UTEP is providing. There is a training module and video posted on our Blackboard site. UTEP policies currently include the following:

This course has a hybrid component that permits for actual face-to-face interactions with faculty and other students enrolled in this class. As you enter or exit campus (or any off-campus class meeting), minimize the number of encounters with others to avoid infection by the SARS-CoV-2. Use preventive safety and health measures at all times until informed otherwise by campus officials. Everyone who attends in-person activities must wear a face covering over their nose and mouth at all times while such meetings are taking place, maintain social distance of a minimum of 6 or more feet, and practice proper hygiene practices. If you choose not to wear a face covering, you may be asked to leave. If you remove your face covering, you will be asked to put it on or leave. Students who refuse to wear a face covering and/or refuse to follow preventive COVID-19 guidelines will be dismissed from the class and will be subject to further disciplinary action according to the UTEP Handbook of Operating Procedures (Section 1.2.3: Health and Safety; Section 1.2.2.5: Disruptions).

Students have the following responsibilities:
- Complete COVID-19 student training at the start of the semester by visiting https://covidtraining.questionpro.com/

- You must STAY AT HOME and REPORT if you: (1) have been diagnosed with COVID-19, (2) are experiencing COVID-19 symptoms; or (3) have had recent contact with a person who has received a positive coronavirus test. Reports should be made at http://screening.utep.edu. You are advised to minimize the number of encounters with others to avoid infection. **Students are not permitted on campus (or on field trips) when they have a positive COVID-19 test, exposure, or symptoms.**

- For each day that you attend campus – for any reason – you must complete the self-screening questions on the UTEP screening website (http://screening.utep.edu) **prior to arriving on campus on each visit**. The website will verify if you are permitted to come to campus. **The same applies to field trips.**

- Wear a face covering at all times when in common areas of campus or when others are present.

- When on campus or when others are present, maintain 6 feet of separation at all times, including when talking with others.

- Follow campus signage indicating specific entry and exit doors and pathways.

- When on campus, do not cluster in groups and keep hallways open.

- Wash hands and/or apply hand sanitizer prior to entering classroom and after leaving a classroom. Do not your touch face until after your hands are washed/sanitized.

- Use an alcohol wipe, provided outside of classrooms, to sanitize desks, chairs, or tables.

- Clean/sanitize shared tools, equipment, and materials after use.

- Follow faculty protocols for leaving and re-entering classrooms.

- Contact the instructor if **<u>temporary</u>** accommodations due to COVID-19 are needed (i.e., due to positive COVID-19 test, symptoms, or exposure).

- Students who are considered high risk according to CDC guidelines and/or those who live with individuals who are considered high risk may contact Center for Accommodations and Support Services (CASS) to discuss temporary accommodations for on-campus/face-to-face courses and activities.

- If unable to wear a face covering (e.g., for medical reasons), the best course of action is to enroll in courses that are entirely online or to work with academic advisors, if necessary, to identify alternative courses. If this is not possible, request an accommodation CASS prior to reporting for in-person activities. **<u>Students who receive an accommodation to not wear a face covering must share this with the professor and work to minimize contact with others in the class.</u>**

Non-compliance with on-campus UTEP policies can result in dismissal from the course, a report to OSCCR (https://cm.maxient.com/reportingform.php?UnivofTexasElPaso), or to Campus Police.

Accommodations Policies:

UTEP is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS) (https://www.utep.edu/student-affairs/cass/ada-policies/accommodations-for-individuals-with-disabilities%20.html) Note that the student is responsible for following up with the instructors about any accommodation letters and instructions.

Military Service:

If you are a military student with the potential of being called to military service and/or training during the course of the semester, you are encouraged to contact the instructors as soon as possible.

Student Resources:

UTEP provides a variety of student services and support, including:
- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.

- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- Military Student Success Center: UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- Center for Accommodations and Support Services (CASS): Assists students with ADA-related accommodations for coursework, housing, and internships.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

Course Outline and Schedule:

Note that the details of our schedule are likely to change as the semester progresses, particularly in light of the current COVID-19 circumstances. Please be flexible, and let Dr. Hurtado know if you have any concerns or suggestions. A preliminary, detailed schedule is attached.

Schedule Notes:

1. *All lecture materials will be online. While there may be one or two live (and recorded), all-hands meetings on Blackboard, all lectures will be pre-recorded for you to watch asynchronously. While online, the lecture component is not self-paced. We will follow a tight weekly schedule.*
2. *All of the lab materials will be online, but will not be self-paced. We will follow a tight weekly schedule.*
3. *All new materials, including assignments, will be posted to Blackboard by noon on Mondays. Assignments are due by 11:59 pm on the following Monday.*
4. *There will be weekly opportunities for face-to-face video "office hours" with the instructor/TA using Blackboard Collaborate and also the Discussion Boards (see schedule above).*

Week	Dates	Lecture Topics	Assignments
Week 1	Aug. 24-28	Introduction: Definition, History, and Overview	Homework 1: Research/Reading Assignment
Week 2	Aug. 31-Sept. 4	Electromagnetic Radiation (EMR) Principles:	Homework 2: Electromagnetism
Week 3	Sept. 8-11	Electromagnetic Radiation (EMR) Principles	
Week 4	Sept. 14-18	Aerial Photography, Image Interpretation, and Photogrammetry	Lab 1: Image Interpretation
Week 5	Sept. 21-25	Multispectral and Hyperspectral Remote Sensing	Homework 3: VNIR-SWIR
Week 6	Sept. 28-Oct. 2	Thermal Infrared Remote Sensing	Homework 4: TIR
Week 7	Oct. 5-9	Microwave Remote Sensing	Homework 5: RADAR
Week 8	Oct. 12-16		**Midterm Exam: will be online this week**
Week 9	Oct. 19-23	LiDAR Remote Sensing and Other Techniques	Lab 2: ENVI functionality and interface tutorials
Week 10	Oct. 26-30	Remote Sensing of Geologic Materials	Lab 3: ENVI tutorials on multispectral analysis and classification
Week 11	Nov. 2-6	Remote Sensing of Vegetation and Water	Lab 4: ENVI tutorials on hyperspectral data and analysis
Week 12	Nov. 9-13	Sensors and Satellites	Homework 6: Sensors and Satellites
Week 13	Nov. 16-20	TBD	
Week 14	Nov. 23-25	Thanksgiving Break Week	
Week 15	Nov. 30-Dec. 3	TBD	**Final Exam: scheduled by UTEP for Friday, December 11, 10 am – 12:45 pm (will be online)**