REMOTE SENSING (SUR 4380) SYLLABUS

COURSE DESCRIPTION

Remote sensing systems, ground-truthing procedures, air photo interpretation, satellite image processing and classification, radar imagery, lidar, satellite-, aircraft-, and drone-borne flight systems, cloud-based computing for remote sensing, applications of remotely sensed imagery, remote sensing, and geographic information systems. The goal of this course is to provide students with an understanding of the scientific and engineering principles behind remote sensing and to provide an understanding of the state-of-the-art of remote sensing.

INSTRUCTOR

Dr. Eben Broadbent, https://ffgs.ifas.ufl.edu/faculty/broadbent-eben/

Spatial Ecology & Conservation Lab, www.speclab.org
303 Reed Lab, School of Forest Resources and Conservation
Mobile: 1-650-204-1051 (text or calls as is necessary).

Email: Please use Canvas as otherwise emails might get lost in my other correspondence, but if needed for some reason it is eben@ufl.edu.

COURSE SCHEDULE

Due dates will be posted and updated in the Canvas calendar section (which is summarized at the end of this syllabus as well).

LECTURES AND DISCUSSION

Schedule: Tuesdays, Periods 7- 9 (1:55 PM - 4:55 PM).

In-person: RLA0302, https://campusmap.ufl.edu/#/index/0131

Virtual: This is via Zoom. The passcode to access the Zoom is: "***To be provided***" Pre-registration is required at: "***To be provided***".

After registering, you will receive a confirmation email containing information about joining the meeting. Note the Zoom page here in Canvas which helps to organize and find links, etc.

Academic calendar (2021-22): https://catalog.ufl.edu/ugrad/current/Pages/adspring1718.aspx

Exam dates: See the latest version of the course schedule available under 'Pages'.
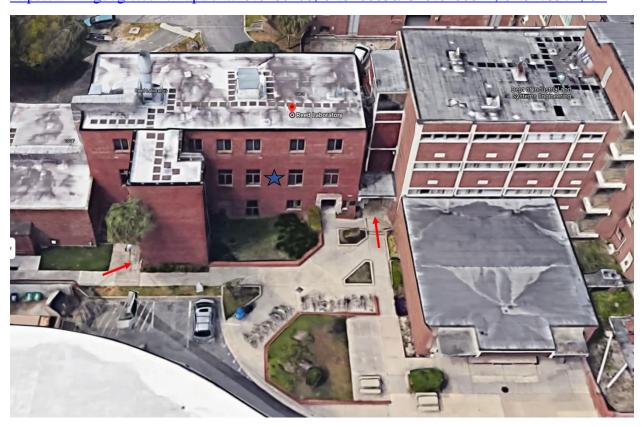
OFFICE HOURS

Tuesdays, 10:30 am – 12:30 pm, and via special appointment. I will be in-person in my office during this time and, by appointment (email, phone call), can be logged into Zoom session with a waiting room for a virtual appointment. Most efficient is to email me via canvas in advance to schedule an appointment to ensure you have a spot and that I am available.

OFFICE HOUR LOCATION

Office hours are available both in-person and virtually. Please schedule a virtual appointment with me during this time, or another time if needed, and I will provide a Zoom link and password.

In-person location: 303 Reed Lab, see Google Map link below for approximate location:

https://www.google.com/maps/dir//29.6480108,-82.3480838/@29.6480842,-82.3473972,19z

Figure. A 3D view of Dr. Broadbent's office (blue star) and two entrances (red arrows) to access the '3rd' floor. The office door is located directly across from the Geomatics administrator's main office.

COURSE MATERIALS

Textbooks (required): (1) Remote Sensing and Image Interpretation by Lillesand, Kiefer, and Chipman,7th Edition, 2015. Wiley, and Sons. ISBN: 9781118343289. **(2)** Remote sensing of vegetation: Principles, techniques, and applications by Jones & Vaughan.1st Edition, 2010. Oxford University Press. ISBN:9780199207794.

Textbooks (optional): (1) Remote Sensing: Principles, Interpretation, and Applications, by Sabins & Ellis. 4th edition, 2020.

Course website: In Canvas.

Software: Access to ENVI and ArcGIS software is required for this course. ENVI can be accessed by purchasing a student ENVI license or using the UFApps at: https://info.apps.ufl.edu/ and which can be accessed from any computer using VPN or on campus directly, using your UFL login information. A free student version of ArcGIS can be obtained at the following link https://www.geoplan.ufl.edu/software/ or via UFApps as described above.

GOAL & OBJECTIVES

Topics:

Remote sensing systems, ground-truthing procedures, air photo interpretation, satellite image processing and classification, radar imagery, applications of remotely sensed imagery, remote sensing, and geographic information systems.

Goal:

The goal of this course is to provide students with an understanding of the scientific and engineering principles behind remote sensing and to provide an understanding of the state-of-the-art of remote sensing.

Objectives of Course:

(1) Provide an understanding of the principles of electromagnetic radiation pertaining to remote sensing. (2) Provide an understanding of instruments currently used in remote sensing and their appropriate application. (3) Demonstrate computer hardware and software used in remote sensing.

TOPICS

Topics to be addressed include:

- Flight platforms:
  - space
    - satellites
    - space station
  - high-altitude (balloons)
  - aircraft
    - fixed-wing
    - copters
  - drones
    - fixed-wing
    - VTOL
    - copter
  - terrestrial
- Passive remote sensing
  - fundamentals of the electromagnetic spectrum
    - energy sources and radiation principles
    - energy interactions in the atmosphere
    - energy interactions with Earth
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  - visual imaging (passive)

    - elements of photography
    - film types (black and white, color, color infrared)
      - formats and scale-cameras
    - digital
      - formats
        - storage and manipulation of data
    - applications of photographic products
      - topographic and planimetric mapping
      - environmental monitoring
  - processing of visual (and other) imagery
    -
      - geometric correction
        - orthorectification (satellite and aircraft borne)
        - photogrammetry (satellite and drone borne)
  - applications
    - digital elevation models (limited utility)
    - digital surface models
  - multi- and hyperspectral imaging (passive)
    - platforms
    - preprocessing
      - radiometric correction
        - radiance to reflectance
          - tarps
          - atmospheric models
          - in situ sensors

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- - - spatial and spectral enhancement
      - pan-sharpening
    - classification
      - unsupervised
        - ISODATA
      - supervised
        - nearest neighbor
      - accuracy assessment
        - error matrices
  - applications
    - vegetation
    - mineralogy
- thermal infrared imaging
  - principles of thermal infrared radiation
  - radiant vs kinetic temperature
  - applications
    - conservation biology
    - human presence monitoring
    - plant health
    - fire dynamics
- Active remote sensing
  - radar
    - satellite and aircraft borne
      - resolution
      - azimuth
      - range
    - terrestrial-borne systems
      - ground-penetrating radar
  - lidar
  - applications of active systems
    - terrain analysis
    - pollution detection and monitoring
    - moisture assessment
    - target recognition
- Data fusion
  - active + passive
  - aircraft-borne
    - NEON airborne observation platform (AOP)
  - drone-borne
    - GatorEye Unmanned Flying Laboratory
  - segmentation (eCognition)
- Global cloud-based analyses
  - Google earth engine (GEE)

GENERAL

Students are registered in either an (A) in-person section or a (B) virtual section. Students registered in the in-person section may join class either in-person or using Zoom at their discretion. Students in the virtual section should join virtually unless they receive special permission from the instructor to attend in person (due to maximum students per classroom), for example, if you are a distance student visiting campus.

In-person:

https://campusmap.ufl.edu/#/index/0131 (Links to an external site.) - RLA0302 (Reed Lab)

Virtual:

Register in advance for this meeting: "To be provided". After registering, you will receive a confirmation email containing information about joining the meeting.

Attendance expectations:

Regardless of whether you are attending class in-person or virtually, you have the same expectations for attendance, involvement in lecture activities, and discussion and interaction. Please be prepared to do so using audio and video to enable full and efficient communication with the class and your project groups. For students attending in-person, please bring a laptop with Zoom installed, and headphones/microphone (e.g., like what a smartphone manufacturer provides to make phone calls works fine).

AVOIDING PLAGIARISM

During your academic coursework, you will be expected to use a variety of resources, publications, and references to support your assumptions and conclusions. Failure to attribute credit to your sources is a violation of UF's Honor Code and can carry serious consequences. It is vital that you properly credit and cite your sources in every instance in which you include: direct quotations, ideas from other sources, whether paraphrased or summarized, and/or facts that are not considered common knowledge.

If you use someone else's words, ideas, or even if you simply gather facts, you must give the original source credit. Whenever you are in doubt about a particular item, cite it! This serves an important purpose in addition to preserving academic integrity. Along with your bibliography, it indicates to your reader the extent of your research; it also allows the reader to pursue aspects of your topic on their own.

For specific rules on citation formatting, you should follow the guidelines provided by your individual instructors. For more information about plagiarism and academic honesty, visit the UF Library Guide: Attribution & Plagiarism (Links to an external site.).

N E T I Q U E T T E

Communication Courtesy: All class members are expected to follow common courtesy rules in all email messages, threaded discussions, and chats.

When communicating online, you should always:

- Treat everyone with respect, even in email or in any other online communication.
- Use clear and concise language.
- Remember that all college-level communication should have correct spelling and grammar.
- Avoid slang terms such as "wassup?" and texting abbreviations such as "u" instead of "you."
- Use standard fonts such as Times New Roman and use a size 12 or 14 pt. font.
- Avoid using the caps lock feature AS IT CAN BE INTERPRETED AS YELLING.
- Be cautious when using humor or sarcasm, as tone is sometimes lost in an email or discussion post, and your message might be taken seriously or offensive.
- Be careful with personal information (both yours and others).

When posting on the Discussion Board in your online class, you should:

- Make posts that are on-topic and within the scope of the course material.
- Take your posts seriously and review and edit your posts before sending them.
- Be as brief as possible while still making a thorough comment.
- Always give proper credit when referencing or quoting another source.
- Be sure to read all messages in a thread before replying.
- Don't repeat someone else's post without adding something of your own to it.
- Avoid short, generic replies such as, "I agree." Include why you agree or add to the previous point.
- Always be respectful of others' opinions even when they differ from your own.
- When you disagree with someone, you should express your differing opinion in a respectful, non-critical way.
- Do not make personal or insulting remarks.
- Be open-minded.

L E A R N I N G   S T R A T E G I E S

- Take advantage of office hours (in-person or online) to ask questions or get clarification in real-time.
- Save files such as readings/handouts to your own computer so that you can access them later after the course has closed. Courses close about a week after the semester ends, and you will not be able to be "added back" to previous courses in order to study for a final exam or defense.
- Take notes while watching the lectures and have a system for saving those for posterity. Most online courses provide a "printer-friendly PDF" of each lecture presentation. You

can print these out to hand-write your own notes while watching the lecture (or annotate it electronically).

- Check out the UF Writing Studio (online appointments are available).
  Explore Lynda.com – log in with your gatorlink towards the right on the main eLearning page for free training and tutorials on hundreds of subjects and programs like Excel, Python, Photoshop, AutoCAD, etc.

UF HONOR CODE

As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

The instructors of this course fully support the intent of the above statement and will not tolerate academic dishonesty. We, the members of the University of Florida Community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

All students are expected to follow the University of Florida Honor Code (excerpt above). Read more: https://sccr.dso.ufl.edu/ (Links to an external site.).

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT

Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/. (Links to an external site.)

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, disability.ufl.edu (Links to an external site.)) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

UF WRITING STUDIO

 A campus resource available for students wanting to become better writers. Students have the opportunity to work one-on-one with a consultant on issues specific to their own particular development. To get more information or schedule an appointment, visit http://writing.ufl.edu/writing-studio/. (Links to an external site.)

COUNSELING AND WELLNESS

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. Both the Counseling Center and Student Mental Health Services provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling Center, 301 Peabody Hall, 392-1575, www.counseling.ufl.edu (Links to an external site.)
- Student Mental Health Services, Rm. 245 SHCC, 392-1171, www.shcc.ufl.edu (Links to an external site.)
  - Alcohol and Substance Abuse Program (ASAP)
  - Center for Sexual Assault / Abuse Recovery & Education (CARE)
  - Eating Disorders Program
  - Employee Assistance Program
  - Suicide Prevention Program
- University Police Department: 352-392-1111 or 9-1-1 for emergencies.

Other centers

- Veterans and Active Duty Military
- Career Resource Center, Reitz Union, 352-392-1601, career development assistance and counseling

U MATTER, WE CARE

The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu. A nighttime and weekend crisis counselor is available by phone at 352-392-1575.

TEACHING EVALUATIONS

The School of Forest Resources & Conservation cares about your experience and we will make every effort to address course concerns. We request that all of our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered. If you have a more urgent concern, your first point of contact should be our Distance Education Coordinator for the SFRC, Rhiannon Pollard. You may also contact the Graduate or Undergraduate Coordinator for the program offering the course, if you prefer. More information on the University of Florida student complaint process can be found here. (Links to an external site.)

ADDITIONAL RESOURCES & INFORMATION

- Gator1 Card (Links to an external site.) - Distance students can complete the application and get an official UF Gator1 ID card
- SFRC Spring Celebration (Links to an external site.) – Join us at the annual event in Gainesville, FL for networking and fun group activities.

GRADE EVALUATION

Lecture questions and activities	25%
Group projects	25%
Midterm and Final exam	30%
Group independent projects and presentations	20%
TOTAL	**100%**

Alternate grading schemes will be negotiated on a per-student basis, specifically for those with documented full-time conflicting work schedules.

GRADING SCALE

The following grading scale will be used to determine end-of-semester performance.

A = 93% & above;   A- = 90% to 92.99%;

B+ = 87% to 89.99%; B = 83% to 86.99%; B- = 80% to 82.99%

C+ = 77% to 79.99%; C = 73% to 76.99%; C- = 70% to 72.99%

D+ = 67% to 69.99%; D = 63% to 66.99%; D- = 60% to 62.99%;

F = Below 60%

Each of the assignments will be evaluated as part of the course grade; please manage your time wisely.

TECHNICAL REQUIREMENTS

- Canvas supports only the two most recent versions of any browser software. **Safari, Internet Explorer and Microsoft Edge are not recommended.** What browser am I using? (Links to an external site.)
- For this course, you will also need to use Adobe Reader and Microsoft Office or equivalent. Login to Office365 at UF (Links to an external site.)Links to an external site.
- You may need a **headset microphone and a webcam**. Lectures are normally streamed, not downloaded and require a fast and reliable internet connection. **Closed captioning** is available on most prerecorded lectures. They can be toggled on/off by clicking the CC button at the bottom of the screen.
- A **wired connection** is required for quizzes and exams. If technical issues arise during the exam, you must call the UF Helpdesk for a time-stamped ticket at 352-392-4357.
- If accessing on a mobile device, you can download the free Canvas app. **Do not use the app for submitting assignments or exams.**
- Connecting to UF Library Resources from Off Campus (using Course Reserves / ARES)
  - **IMPORTANT:** You must have the UF VPN Client installed on your computer, and be logged into the UF VPN Client before viewing UF Library eResources or course reserve materials using an off-campus network. For information on installing and using the UF VPN Client, go to How to Install Cisco AnyConnect for UF VPN (Links to an external site.)Links to an external site.. **For technical assistance with the UF VPN Client, please call the UF Computing Help Desk, at 352-392-4357.**