ADVANCED REMOTE SENSING IN ENGINEERING: SCIENCE, SENSORS, & APPLICATIONS
ABE 6035

Class Periods: TR, 8:30-9:45am (10:25am for exams, make-up classes, & presentations)
Location: Rogers Hall Room 129
Academic Term: Spring 2022

Instructor
Prof. Jasmeet Judge, Rogers Hall-205
Phone: 294-6750 Email: jasmeet@ufl.edu
Office hours: TR 9:45-10:45am (after class) or by appointment

Course Description
Develop an understanding of remote sensing theory, systems and applications using information obtained from the visible/near infrared, thermal infrared and microwave regions of the EM spectrum.

Course Pre-Requisites/Co-Requisites
MAP 2302 or the equivalent

Course Objectives
The main objective of the course is to develop an understanding of remote sensing theory and systems in visible; infrared; and microwave regions of the EM spectrum. The course is divided into three parts. The first part includes science and theoretical basis of remote sensing. The second part of the course involves system characteristics of sensors used in the three regions, including sensor design, calibration, and performance issues. The third part includes student presentations on various applications of remote sensing.

The course is designed for graduate students in the College of Engineering who have a strong background in differential/integral calculus, and preferably, in applied physics. It is primarily a lecture-based course with in-class problems, exams, homework assignments, and an analysis-based project.

Text Recommendations
There is no required text. Handouts will be provided on course website from the following books:
(C) Elachi, C., Introduction to the Physics and Techniques of Remote Sensing, John Wiley & Sons, 1987.
(LK) Lilesand and Keifer, Remote Sensing and Image Interpretation, John Wiley & Sons, 2003.
(MRS1) Ulaby, Moore, and Fung, Microwave Remote Sensing: Volume I, Fundamentals and Radiometry, Addison-Wesley, 1981.
(MRS2) Ulaby, Moore, and Fung, Microwave Remote Sensing: Volume II, Active, Addison-Wesley, 1981.
(S) Schott, J., Remote Sensing: The image change approach, Oxford University Press, 1997.
(SE) Schultz and Engman, Remote Sensing in Hydrology and Water Management, Springer, 2000.
(U) Ulaby, F., Fundamentals of Applied Electromagnetics, Prentice Hall, 2006.

All relevant materials and handouts are provided on the Canvas course website: http://elearning.ufl.edu/

Course Outline:

PART I: Science and Theory of Remote Sensing: (Weeks 1-6)

1. Introduction
   - Electromagnetic (EM) spectrum
   - Applications of remote sensing
2. Radiative transfer theory in VI, IR, & Microwave

Exam I

PART II: Sensors in Remote Sensing (Weeks 7-13)

1. Passive sensors used in the Visible, IR, & Microwave regions
2. Active Sensors in Visible/NIR and Microwave regions

PART III: A Project on Remote Sensing Applications to Engineering (Weeks 12-15)

The project will include remote sensing analyses-based project that includes a presentation and a technical report on a topic of student's interest.

Exam II

Attendance Policy, Class Expectations, and Make up Policy

Classes will be primarily lecture-based, with material presented and discussed in-person. Unless a legitimate reason is provided *prior* to the due date, homework assignments turned in after the due date will count for 25% less than the scored points if turned in *before* the next class past the due date. The assignments turned in after the next class past the due date or after the grades and solutions have been posted will receive a zero. An exam or a project for another course *is not a legitimate reason* to miss due dates for this course.

In-class problems will be completed during class and students are expected to turn them in via Canvas course website within 10 minutes following the class period. No makeup will be offered, as students are allowed to miss three in-class problem-sets during the semester.

No makeup will be offered for missed quizzes and exams unless agreed upon by the instructor based upon a legitimate reason provided *prior* to the date of the exam. Excused absences must be consistent with university policies in the graduate catalog ((https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation *prior* to the due dates, quizzes, and exams.

Evaluation of Grades

Final grades (100%) will be assigned based upon homework assignments (25%), in-class problems (5%), two quizzes (5% each), two exams (15% each), project (total=30%, with topic 5%; written report 10%; presentation 15%)

Grading Policy

$90 \leq A$

$80 \leq B < 85 \leq B+ < 90$

$70 \leq C < 75 \leq C+ < 80$

$60 \leq D < 65 \leq D+ < 70$

$E < 60$

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publishing without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of

Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:
Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. 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 so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

COVID-19

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall*,* 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.