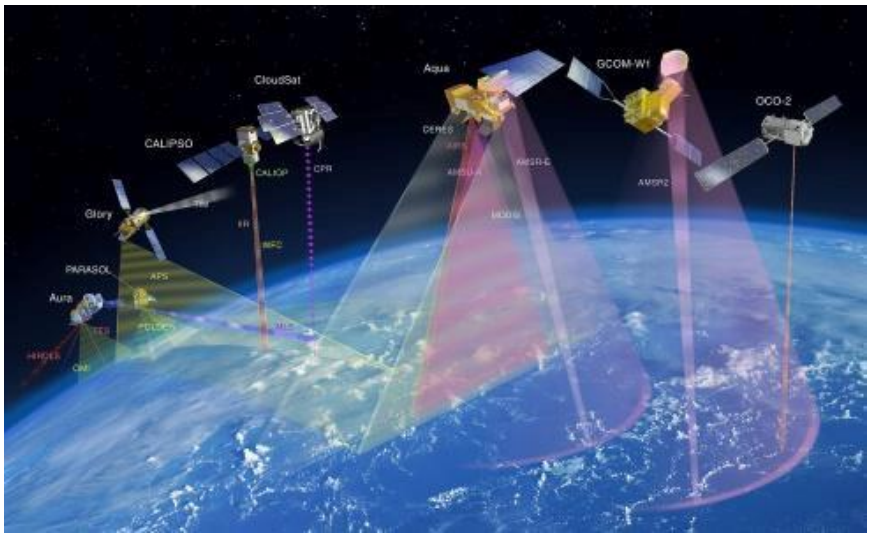
GGS426-001, Fall 2022 (Hybrid)

Physical Fundamentals of Remote Sensing



Course Information

Title: GGS426-001 Physical Fundamentals of Remote Sensing (Hybrid)

Time: Tuesdays 4:30 - 5:45 PM

Classroom: Exploratory Hall 2312

Instructor: Dr. John Qu

Telephone: (703) 993-3958

Office: Exploratory Hall, Room 2412

Office Hour: Stop by 1:30-3: & 3:30 PM on Tuesdays or make appointment

Course Description

This course is designed to give undergraduate students with limited Earth science satellite remote sensing background a thorough introduction to gather the basic concepts and physical fundamentals of remote sensing. The main emphasis of this course is on the basic physical and mathematical principles underlying the satellite remote sensing techniques, including radiometric and geometric information, satellite orbit and geo-location simulation, designing, atmosphere corrections, raw data record (RDR), sensor data record (SDR), environment data record (EDR), climate data record (CDR) and in situ measurements in support of remote sensing. In addition,

this class will provide a focus on the NASA, NOAA and USGS current and future satellite instruments. This course aims to provide students all-inclusive overview of the state of the art in physical fundamentals of remote sensing for monitoring global, regional and local atmosphere, ocean and land surface.

Detailed Schedule

Week one	Introduction to Earth science satellite remote sensing
Week two	Physical fundamentals of remote sensing
Week three	Top atmospheric solar radiation (Quiz one)
Week four	Atmospheric absorption and scattering
Week five	Radiation transfer in the atmosphere (Quiz 2)
Week six	Applications radiation transfer principles to remote sensing
Week seven	Platform for remote sensing and Raw Data Record (RDR) data products
Week eight	Satellite orbit and geo-location simulation
Week nine	Mid-term
Week ten	Sensor Data Record (SDR) data products
Week eleven	SDR algorithms and calibrations (Quiz 3)
Week twelve	Atmospheric correction and surface reflectance
Week thirteen	Selected Environmental Data Record (EDR) data products (Quiz 4)
Week fourteen	Selected Climate Data Record (CDR) data products
Week fifteen	Final project presentations

Grading:

Grades will be based upon students' performance on the homework exercises, midterm, class attendance and final term paper and presentation. The weighted contribution of each of these items to your final grade is given below:

- Homework 15%
- Quiz 20%
- Midterm: 25%
- Final Exam 30%
- Class Attendee 5%

(A=90-100, B=80-89, C=70-79, D=60-69, F=<60)

Prerequisites:
College Math (such as MATH 214) and physics (such as PHYS 262), or permission of instructor.

Required Textbook: None

Reference Books:

1. Kuo-Nan Liou, 2002, An Introduction to Atmospheric Radiation, Second Edition, Academic Press, ISBN 0-12-451451-0
2. Charles Elachi, 1987, Introduction to the Physics of Remote Sensing, Wiley Series in Remote Sensing, John Wiley & Sons Inc., ISBN-0-471-84810-7.
3. Wiley J. Larson and James R. Wertz, 1997, Space Mission Analysis and Design, Space Technology Series. Kluwer Academic Publishers, ISBN 1-881883-01-9 (paperback), ISBN 0-7923-1998-2 (hardback).

Honor code:

Students must follow the GMU Scholastic Honor Code. Please show respects to everyone in the classroom. Copying homework (or quiz) is considered cheating.