

University of Puerto Rico
Mayagüez Campus
College of Arts and Sciences
Department of Geology

1. General Information:

Course Number: GEOL 4048
Course Title: Geological Applications of Remote Sensing
Credit-Hours: 3 credit hours. Two hours of lecture and one 2-hour laboratory per week
Pre-requisites: MATE 3031 and FISI 3151 or Authorization of the Department's Director

2. Course Description:

This course is an introduction to the theory and techniques of remote sensing tools with emphasis on the geosciences. It also includes the discussion of image processing and analysis. The laboratory work focuses on learning the basics of remote sensing by processing and interpreting digital images with the software ENVI.

3. Course Objectives:

- A. To understand the principles of remote sensing techniques and their applications to the analysis of geological and environmental problems.
- B. To develop an understanding of the physical principles of remote sensing, including energy sources, electromagnetic radiation, atmospheric interactions, and data acquisition.
- C. To examine various techniques and sensors, such as aerial photography, multispectral and hyperspectral remote sensing, and Synthetic Aperture Radar.
- D. To introduce image processing and interpretation.
- E. To apply remote sensing methods to the evaluation of problems in the Earth Sciences, including the geosphere, hydrosphere, atmosphere, and biosphere.

4. Course time frame and thematic outline:

Topic	Contact Hours
Introduction to the course	2
History and Scope of Remote Sensing	2
Electromagnetic Radiation	2
Field Radiometric Measurements	2
Mapping Cameras, Digital Imagery	2
Processing of Aerial Photography	2
Image Interpretation, Land Sensors	2
Interpreting digital images	2
Active and Thermal Sensors, Image Resolution	2
Images with different resolutions	2
Preprocessing, Project Presentations	2
Preprocessing methods	2

Image Classification, Project Presentations	2
Classification of digital images	2
Hyperspectral Remote Sensing, Atmospheric Sciences	2
Processing Hyperspectral Data	2
Plant Sciences	2
Vegetation Index	2
Earth Sciences	2
Minerals Identification	2
Hydrospheric Sciences	2
Ocean Color	2
Geographic Information Systems	2
Work with projects	2
Final Presentations	4
Exams (Two partials and a final)	6
TOTAL HOURS	58

5. Instructional Strategies:

- A. Conference
- B. Laboratory
- C. Computation
- D. Discussion
- E. Oral Presentations
- F. Written Reports
- G. Scientific Readings
- H. Research Activities
- I. Course Project

6. Instructional Resources Available or Required:

This course includes 2 hours of laboratory work per week for learning the skills of image processing, interpretation and analysis using ENVI, ArcGIS, and free software (like SNAP).

All course material, including lectures notes, tutorials and additional readings will be available in the Moodle platform: online.upr.edu

7. Evaluation Strategies and Grading System:

Two partial and one final examinations (100 pts. each)

Laboratory work: Laboratory reports (60 pts.) and laboratory practical exam (40 pts.)

Research project: Letter of intent (10 pts.), oral presentation of the proposed work (20 pts.), final oral presentation (20 pts.), written report (40 pts.), and partners' evaluation (10 pts.)

Final grade will be based on 500 points and using the following ranges:

A = 100-89%

D = 64-55%

B = 88-78%

F = 54-0%

C = 77-65%

8. Bibliography:

Textbook: Introduction to Remote Sensing

James B. Campbell and Randolph H. Wynne (2011) Fifth Edition. The Guilford Press.

ISBN: 978-1-60918-176-5

Reference book: Fundamentals of Geological and Environmental Remote Sensing

Robert K. Vincent (1997) Prentice Hall, ISBN: 0-13-348780-6

Reference book: Remote Sensing of the Environment

John R. Jensen (2007) Pearson Prentice Hall, ISBN: 0-13-188950-8

Other readings, like research papers, will be assigned during the semester.

9. Requirements and Policies:

Class attendance: Class attendance is compulsory. The University of Puerto Rico at Mayaguez reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student.

Absence from examinations: Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed.

Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays.

Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar.

Complete withdrawals: A student may completely withdraw from the University of Puerto Rico at Mayaguez at any time up to the last day of classes.

Law 51: The Comprehensive Educational Services Act for People with disabilities states that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information, contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

Academic Integrity: The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees

Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.

Policy Against Discrimination Based on Sex, Sexual Orientation, and Gender Identity: The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, may turn to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or formal complaint.

Sexual Harassment: Certification 130-2014-2015 states: Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

Others: Some questions in the exams will be taken from material discussed only in class and not covered in the textbook or reading material.

10. Instructor Information:

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