



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



Course Syllabus

1. General Information:

Alpha-numeric codification: BIOL 5038

Course Title: BIOLOGICAL APPLICATIONS OF REMOTE SENSING AND
GEOGRAPHICAL INFORMATION SYSTEMS

Number of credits: 3

Contact Period: Two hours of lecture and one three-hour laboratory per week

2. Course Description:

English: Students will learn the theory of extracting information from remotely sensed data, its integration into geographical information system (GIS) databases, and its use for the study and management of biological systems. Students will extract information of biological interest from remotely sensed data and other types of geographic data, will assemble at least one geographic database, and use that geographic database to study the relationships between one or several organisms and several environmental variables.

Spanish: El estudiante aprenderá la teoría sobre la extracción de información de datos generados por percepción remota, su integración a bancos de datos de sistemas de información geográfica (SIG), y su uso para el estudio y manejo de sistemas biológicos. Además, el estudiante extraerá información de interés biológico a partir de datos obtenidos por percepción remota y de otros datos geográficos, generará al menos un banco de datos geográficos, y utilizará ese banco de datos para estudiar la interacción existente entre uno o varios organismos con varias variables ambientales.

3. Pre/Co-requisites and other requirements:

MATE 3172 or MATE 3005 or authorization of the Director of the Department.

4. Course Objectives:

1. Handling information of the extent and location of terrestrial and aquatic ecosystems.
2. Integration of remote sensing information and other sources into geographic information systems.
3. Analysis of this information for the study and management of biological systems.
4. Design of spatial models for interpretation and management of ecological systems.

5. Instructional Strategies:

☒conference ☒discussion ☒computation ☒laboratory

☒seminar with formal presentation ☐seminar without formal presentation ☐workshop

☐art workshop ☒practice ☐trip ☐thesis ☐special problems ☐tutoring

☒research ☒other, please specify: Written Reports

6. Minimum or Required Resources Available:

This course includes 3 hours of laboratory work per week for learning the skills of image processing, interpretation and analysis using ArcGIS, and free software. This activity will be performed in the computing laboratory of the Biology Department that is equipped with the required resources. The students will need access to the internet in order to review relevant material for the course and scientific references (i.e. peer-review papers).

7. Course time frame and thematic outline

Outline	Contact Hours
Introduction; Remote Sensing of the Environment	2
Lab. 1-Exploring Online Resources	3
Introduction to Geographic Information Systems (GIS)	2
Lab. 2-Working with ArcGIS	3
Global Positioning Systems (GPS)	2
Lab. 3-Processing and Interpreting GPS data	3
Map Projections and Coordinate Systems	2
Lab. 4-Interacting with maps and data	3
Electromagnetic Radiation Principles	2
Lab. 5-Field Radiometric Measurements	3
Aerial Photography	2
Lab. 6-Analysis of aerial photos	3
Multispectral Remote Sensing Systems	2
Lab. 7-Processing and Analysis of Multispectral Images	3
Introduction to Unmanned Aerial Vehicles (UAV)	2
Lab. 8-Processing and Analysis of Drones Images	3
Mid Term Exam	2
Lab. 9-Symposium PRYSIG 2021 at UPRM	3
Remote Sensing of Vegetation	2
Lab. 10-Estimation and Analysis of Vegetation Indices	3
Remote Sensing of Ocean Color	2
Lab. 11-Processing of Ocean Color Images	3
Remote Sensing of Urban Landscape	2
Lab. 12-Creating Land Use/Land Cover Maps	3
Project Proposal Presentations	2
Project Proposal Presentations	3
Review and Catch up	2
Working with Research Projects	3
Final Presentations of Research Projects	2
Final Presentations of Research Projects	3
Final Exam	2
Total hours: (equivalent to contact period)	77

8. Grading System

☒ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Mid Term Exam	100	25
<input checked="" type="checkbox"/> Final Exam	100	25
<input checked="" type="checkbox"/> Projects	100	25
<input checked="" type="checkbox"/> Other, specify: Lab Reports	100	25
TOTAL:	400	100%

One partial and one final examination (100 pts. each)

Ten (10) laboratory reports (10 pts. each)

Research project: Oral proposal presentation (25 Pts.), final oral report (25 Pts.), and final written report (50 Pts.)

Final grade will be based on 400 points and using the following ranges:

A = 100-89%

B = 88-78%

C = 77-65%

D = 64-55%

F = 54-0%

10. Bibliography:

Textbook: Remote Sensing of the Environment, John R. Jensen (2007) Second Edition. Pearson Prentice Hall. (ISBN: 0-13-188950-8)

Reference books:

Introduction to Remote Sensing, James B. Campbell and Randolph H. Wynne (2011) Fifth Edition. The Guilford Press. (ISBN: 978-1-60918-176-5)

Getting to Know ArcGIS Desktop 10.8, Michael Law and Amy Collins (2021), ESRI Press. (ISBN-13 9781589485785)

GIS Fundamentals: A First Text on Geographic Information Systems, Paul Bolstad (2019) Sixth Edition. XanEdu (ISBN: 978-1-59399-552-2)

Datums and Map Projections for Remote Sensing, GIS, and Surveying. Jonathan C. Iliffe (2008) Second Edition (ISBN: 978-1-59399-552-2)

Other readings, like peer-review papers, could be assigned during the semester.

11. Requirements and General 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. (See Bulletin of Information Undergraduate Studies)

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. (See Bulletin of Information Undergraduate Studies)

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. (See Bulletin of Information Undergraduate Studies).

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. (See Bulletin of Information Undergraduate Studies).

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. (See Bulletin of Information Undergraduate Studies).

12. According to Law 51

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.

13. 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.

14. 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

15. 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.

16. Certification 06-43 of the Academic Senate states, "The academic guidelines for offering online courses," defines:

Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 16-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

17. Instructor Information

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