**Physical Science/Biological Sciences 410/510 Remote Sensing Fall 2017**

**Class hours: T 5:00 – 6:15 Science 259**

 **R 5:00 – 7:15 Engineering 1104**

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Office hours: Axel M 10:00-1200, R 3:00-4:00 (or by appointment)

Oberly MWF 2:00-2:50, TR 4:00-5:00 T 12:00 – 2:00 (or by appointment)

**University Policies:** By enrolling in this course, you agree to the University Policies listed in the reference below. Please read the full text of each policy by going to [www.marshall.edu/academic-affairs](http://www.marshall.edu/academic-affairs) and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to <http://www.marshall.edu/academic-affairs/?page_id=802> Academic Dishonesty/Excused Absence Policy for Undergraduates/Computing Services Acceptable Use/Inclement Weather/Dead Week/Students with Disabilities/Academic Forgiveness/Academic Probation and Suspension/Academic Rights and Responsibilities of Students/Affirmative Action/Sexual Harassment

**Physical Principles of Remote Sensing with Applications. 4 hours**

A study of the physical systems for collecting remotely sensed data. Statistical/spatial analysis and modeling using image processing/geographic information/spatial analysis computer software systems with earth resource applications. (PR: PHY 203 and 204; MTH 225 or permission.)

**Goals/Outcomes:**

**I.** A. Students will learn basic physical principles for satellite orbits, data collection systems and techniques.

B. Students will be assigned readings from a textbook. Basic principles will be discussed in the classroom. Students will observe and analyze demonstrations in class when they are available. Students are expected to be attentive in the classroom and participate in the classroom discussion.

C. Students will be given exams that require the student to demonstrate their knowledge of the principles covered in the classroom and reading assignments. These exams will require logical reasoning about the principles covered.

II. A. Students will learn logical problem solving techniques covering the material listed above.

B. Numerical homework problems will be assigned when appropriate. Software exercises are intended to demonstrate logical approaches to image interpretation.

C. The semester exams, the assigned problems, and the handout problems will all expect the student to be proficient in logical problem solving techniques.

III. A. Each student will be expected to select a major problem of interest to their study area, e.g., a biologist may want to map habitat areas for a particular plant or animal species. The problem must involve digital data and software processes. They are then to work toward solving the problem using the information gained in the course. In particular, the problem and solution **must** be solvable using the software studied in the course.

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B. Software exercises should lead the student through logical paths for analyzing and interpreting images. The primary software package for 410/510 is IDRISI SELVA. Some work with other packages will be required.

C. Each student will present a written summary of their problem statement, problem solution, and discussion of the results at the end of the semester. (See schedule at end of syllabus.) In addition, each student must present a Power Point summary of their project to the class and the faculty. Evaluation of the student work will be based on exam performance and project work.

Required Textbook: Sabins, Remote Sensing, Principles and Interpretation, 3rd Edition, Freeman, 2007. Bound notebook.

**Course Requirements:** Students will be expected do the following:

 Reading assignments from the textbook and other materials.

 Work problems associated with satellite orbits, and spatial and spectral data.

 Use relevant software to manipulate and analyze images.

 Complete relevant physical experiments.

 Take two semester exams – see schedule of assignments.

**Class Schedule:**

**Date: Textbook Software assignments**

August 22, 24 Chapter 1 IDRISI SELVA

August 29, 31 Chapter 1 Spectra/IDRISI SELVA

September 4 **No classes – Labor Day**

September 5, 7 Chapter 1 IDRISI SELVA

September 12, 14 Chapter 2 IDRISI SELVA

September 19, 21 Chapter 3 IDRISI SELVA

 **Project Discussion (25th)**

September 26, 28 Chapter 4 IDRISI SELVA/GPS exercise

October 3, 5 Stats Handout IDRISI SELVA

 **Preliminary Project Title and Scope for Project – due 6th**

October 10 **Exam on Chapters 1, 2, 3 and Stats**

October 12 **Software practical exam #1**

October 17, 19 Chapter 5 Thermal Camera/Blackbody Radiation

October 24, 26 Chapters 6, 7 IDRISI SELVA

October 27 W-day

Oct. 31, Nov. 2 Chapter 8, 12 IDRISI SELVA

Handout Second Semester Exam – Take home – Due November 16th, 5:00 pm

November 7, 9 Chapter 8 IDRISI SELVA/Project

November 14, 16 Chapter 8 IDRIRI SELVA/ Project

 Second Semester Exam – Take home – Due November 16th, 5:00 pm

November 20 through 25 **No classes – Thanksgiving Break**

Nov. 28, 30, Dec.5 RS/GIS Applications IDRISI SELVA/Project

December 7 **Software Practical Exam #2**

 Written Project Papers and logbooks due November 21st at 5:00 pm

December 12 Power Point presentations are due, starting at 5:00 pm

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 The schedule above will be followed as closely as possible. You must pace yourself with the software exercises so that you are ready for the practical exams.

 A typical schedule for a week will be to have a lecture class at the Tuesday meeting. This class can consist of slides/power point demonstrating applications, lecture presentations of physical systems, computations, demonstrations, etc. The Thursday class will consist of software exercises demonstrating how to manipulate digital image data. For this semester the IDRISI SELVA software system will be the primary package used. The schedule above assumes a Tuesday lecture and a Thursday software/experiment presentation.

**Course Grade:**

 Your course grade will be determined by the following:

 First exam (80 points) and first practical exam (20 points) 100

 Second exam (80 points) and second practical exam (20 points) 100

 Project written report 100

 Project power point presentation 100

 Total points 400

Clearly, your project is a very large part of your course grade. You must start thinking about it early and be thorough about its completion and presentation.

 Logbooks will be collected when the papers are due. While not in the above listing for grade contributions, incomplete logbooks can cost you as much as 50 points on your total. That is easily a letter grade.

**Attendance:** Students are expected to attend all scheduled classes, including the software exercise sessions. Classroom discussion and demonstrations are vital for understanding the material covered in the course. During the software sessions you are encouraged to discuss the problems encountered with your classmates. Constructive discussion is part of the learning process. See University Policies above for the attendance policy.