Syllabus for GEOS 654 – Visible and Infrared Remote Sensing

1. Course information:

Title: Visible and Infrared Remote Sensing
Number: GEOS 654
Credits: 3
Prerequisites: GEOS 422 or permission of instructor
Location: WRRB 004: Remote Sensing Lab
Term: Alternate (Even) Spring
Meeting time: Monday and Wednesday; 9:15am to 10.15am; 10.30 am to 11.30am
Website: www.gi.alaska.edu/~prakash/teaching/geos654

2. Instructor Information:

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Name: Christian Haselwimmer
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3. Course readings/materials:

There is no compulsory text book for this class

Recommended text book is:
Remote Sensing Geology by R. P. Gupta (Springer Verlag, Berlin-Heidelberg-New York-Tokyo, 2003; 655p.)

Recommended supplementary reading material is provided on class website.

4. Course description:

This course will cover in depth the principles, physics, sensor technology, processing and applications of remote sensing data in the visible and infrared region, including but not limited to electromagnetic spectrum, radiation laws, spectral signatures, atmospheric interactions, temperature emissivity estimation, analysis and feature extraction from data sets. The laboratory part of the course will provide hands-on experience with special processing techniques, and the possibility of using these techniques for a student-defined term project in areas of geology, volcanology, glaciology, hydrology, environmental sciences, etc.

5. Course Goals and Student Learning Outcomes

Goal: The goal of this course is to take the students beyond what they have learned in a basic remote sensing course (such as GEOS 422 or its equivalent), with special focus on the principles, physics, tools, analysis and applications of remote sensing data acquired specifically in the visible and infrared portion of the electromagnetic spectrum.

Student Learning Outcomes: By the end of the course, students should be able to

- *Relate and Use* various radiation laws
- *Understand* the cause of different spectral responses and the significance of spectral signatures in optical and infrared remote sensing
- *Outline* an optimal plan for data acquisition for their application
- *Perform* atmospheric corrections on visible and infrared remote sensing images
- *Orthorectify* aerial photos and satellite image to remove terrain effects
- *Compute* temperatures and emissivities from remote sensing images
- *Carry out* advance digital processing including special ratios, filtering, fusion techniques, and user defined algorithms.
- *Process* hyperspectral data using spectral feature fitting, spectral unmixing, spectral angle mapping, and cross correlogram spectral matching
- *Apply* the acquired theoretical and practical knowledge to complete an independent term project on a topic of their choice.

6. Instructional methods:

- 75 minute lecture followed by 45 minute lab, meeting twice a week
- Lectures will be interactive and will involve use of power point presentations and group discussions. Material will be posted on the web if possible.
- Laboratory component will include hands-on experience with available image processing software package
- Reading assignments from course text book and research papers on selected topics will be an integral part of the course.
- Independent project work

7. Course calendar:

See class schedule at
http://www.gi.alaska.edu/~prakash/teaching/geos654/schedule_geos654.pdf

8. Course policies:

Attendance in lectures and labs is essential. For some reason, if the course participant can not be present for a lecture or lab, they should inform the instructor in advance and make arrangements for make up of the time. Each student is expected to abide by the UAF Student Code of Conduct (visit: http://www.uaf.edu/catalog/current/academics/regs3.html)

9. Grading Policy:

3 Homework Assignments: 25% (HW1-5%; HW2-10%; HW3-10%)
Literature review homework: 10%
Independent Project: 40%
Lecture and lab participation: 25%

10. Independent Project:

Each student is required to carry out an independent term project. The project must use digital image data acquired in the visible and/or infrared part of the spectrum. Students are encouraged to work on a topic that helps extend their ongoing thesis research or professional work in industry. They are also encouraged to discuss their project early on with the instructor and turn in a 1-2 page project proposal for approval by the indicated day. Students should be aware that the independent term project is time demanding. Though some time will be available during the scheduled lab hours, these hours will be insufficient to complete the project, and students should be prepared to put in extra work hours. Judiciously selected projects with systematic work put in from the very start may be suitable for subsequent publication in either conference proceedings or the peer-reviewed journals. Students should keep this goal in mind as they develop and carry out their projects, and particularly as they prepare their final reports.

11. Disabilities Services:

The instructor will work with the Office of Disabilities Services to provide reasonable accommodation to students with disabilities.