Syllabus for GEOS 422 – Geoscience applications of Remote Sensing

1. Course information:

Title:	Geoscience Applications of Remote Sensing
Number:	GEOS 422
Credits:	3
Prerequisites:	PHYS F104X or PHYS F212X; junior standing; or permission of instructor.
Location:	Lectures WRRB 004; Lab: WRRB 004
Term:	Every Fall
Meeting time:	Lectures: Monday and Wednesday, 1.00pm to 2.00pm Lab: Wednesday, 2.15 pm to 5.15 pm
Website:	www.gi.alaska.edu/~prakash/teaching/geos422

2. Instructor Information:

Anupma Prakash
Office: WRRB-108J, UAF
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Office hours: ad hoc / by appointment
(Email is the best way to reach me. If it is urgent and it is during the evening hours or weekend you can also reach me at my home telephone number: 4554159)

Jordi Cristóbal Rosselló
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Anna (Annie) Worden (Teaching Assistant for Fall 2016)
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3. Course readings/materials:

Course textbook: The textbook we follow in this course is "Remote Sensing and Image Interpretation, 7th Edition" by Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman". The publisher is Wiley (ISBN-13: 978-1118343289; ISBN-10: 111834328X). The book is available at UAF bookstore and is also reserved at the Keith Mather Library, UAF.

If you have a copy of the 5th or 6th edition of the textbook, this will also work for the reading assignments (just that the page numbers are different; anything older than the

5th version is seriously outdated!). The newer version of the textbook has more application examples, and also some updated information on advanced techniques of InSAR and altimetry. Though we do not cover these topics in our course, you should be prepared to peruse through these topics on your own in the library.

Recommended supplementary readings: We will be providing you some reading material that will be specific to the project topics that you may want to take up for your class project. All such reading materials will be posted on the class web site under the restricted access section as pdf files.

All class powerpoint lecture materials, lab instructions, software manuals, and data sets required for your lab assignments will also be posted under the restricted access section of the class web site. You will receive the username and password for this during your first lecture (and this user name and password will not change – probably for several years after you have taken this course – so all material will still be there).

Recommended remote sensing books:

- *Manual of Remote Sensing* volume 3, third edition by RA Ryerson (Wiley, 1999; ISBN 0471294055, 9780471294054)
- *Satellite remote sensing of natural resources* by D.L. Verbyla (CRC Press, FL, 1995; 210 p.; ISBN:1-56670-107-4). Dave Verbyla is a Professor at UAF. So if you have any questions, you can directly walk up to the author and ask ☺.
- *Remote Sensing Geology* by R. P. Gupta (Springer Verlag, Berlin-Heidelberg-New York-Tokyo, 2003; 655p.)
- *Introductory Digital Image Processing: A Remote Sensing Perspective* by John R. Jensen (Prentice Hall, 1996; 318 p.; ISBN 0132058405, 9780132058407)
- *Remote Sensing: Principles and Interpretation* by Floyd F. Sabins (Freeman, 1997; 494 p.; ISBN 0716724421, 9780716724421)

Recommended remote sensing journals:

- International Journal of Remote Sensing
- Photogrammetric Engineering and Remote Sensing
- Remote Sensing of Environment
- IEEE Transactions of Geoscience and Remote Sensing
- Remote Sensing (online)

You are encouraged to make extensive use of UAF's investment in electronic journals. There is a wealth of relevant literature there.

4. Course description:

This course introduces the techniques and applications of remote sensing. The course has an equal emphasis on the (1) physics of remote sensing (2) digital image processing of remote sensing data (3) application of remote sensing. Students will carry out an independent project that will take them through a condensed, yet complete research experience of identifying a science problem/question, designing a

research protocol, carrying out meaningful analysis and effectively addressing the question at hand. Students will learn about the large archive of available geoscience digital data sets; will acquire a proficiency in combining and managing disparate datasets, and increased competence in computational skills required for digital analysis and visualization of data.

5. Course Goals and Student Learning Outcomes:

Goal: The goal of this course is to provide a student-driven learning environment where, through healthy interactions and hands-on training, students will become proficient in the techniques and applications of remote sensing.

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

- *Design* a small research project, outlining the problem, hypothesis, objectives, and methods (based primarily on the use of remote sensing data sets).
- *Search , order/retrieve and, import* remote sensing data relevant to their project.
- *Process* the available remote sensing data using simple and advanced digital image processing techniques to extract relevant thematic information.
- *Analyze and interpret* the spectral signatures in the remote sensing images.
- *Generate* meaningful image map products of a quality that meets the publishing standards of peer reviewed journals or of presentations at scientific meetings.
- *Apply* the acquired theoretical and practical knowledge in remote sensing to complete an independent term project on a topic of their choice.

6. Instructional methods:

- 1 hour lecture meeting twice a week. Lectures will be interactive and will involve use of power point presentations, blackboard, and group discussions. Material will be posted on the web.
- 3 hour laboratory component once a week will include hands-on experience with a variety of digital data and software packages.
- Reading assignments from materials provided and recommended readings on selected topics will be an integral part of the course.
- Independent project work

7. Course calendar:

See class schedule posted on the class web site. The class schedule may change during the course of the academic semester due to various reasons – so please carefully note the version date on the banner of this document. The version on the class website will always be the latest version

8. Course policies:

Attendance in lectures and labs is essential. For some reason, if you can not be present for a lecture or lab, please let me know in advance and make arrangements for

make up of the time. During lecture times you will not be allowed to use any electronic devices such as cell phones, i-pads, laptops, kindles, desktop computers etc (or as Alaska Airlines would say - anything with an on-and-off button). If you have a special situation that requires you to have a cell phone on you, please come and discuss with us to seek permission. We do expect all students to abide by the UAF Student Code of Conduct (see: http://www.uaf.edu/catalog/current/academics/regs3.html). Plagiarism of any sort will not be accepted.

Special Note about Term Project: You are not allowed to submit the project you carry out in one class for getting grades in another related/non-related class. If you are taking another class that requires you to carry out a research project, and you plan to work on a related topic, please discuss with us to determine whether the two projects are sufficiently different. Please also double check with the instructor of the other class. If there is a small fraction of content that you generated in another class and you need to present in your project in this class, or vice-versa, please do make it a point to clearly cross-reference such use.

9. Grading Policy:

Refer to the detail grading policy posted on the class web site. Homework assignments are due on the deadline (date and time) associated with the assignment. Late submissions will be penalized by deducting one point for every day the assignment is late.

10. Independent Project:

Each student is required to carry out an independent term project. The project must use remote sensing images acquired either from a satellite platform or from an airborne platform. Students are encouraged to work on a topic that helps extend their ongoing research or professional work in industry. You are encouraged to discuss your project early on with me and turn in a 1-2 page project proposal for approval by the indicated day. 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 you 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. You should keep this prospect in mind as you develop and carry out your projects, and particularly as you prepare your final report.

11. Disabilities Services:

Should you have any special needs, please come and talk to me about it. I will work with you, and if required with the Office of Disabilities Services to provide all reasonable accommodation.