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 in Reichardt Building; Room 229
Labs in Reichardt Building Computer Lab; Room 316
Term: Every Fall
Meeting time: Lectures: Wednesday and Friday, 1.00pm to 2.00pm
Lab: Wednesday, 2.00pm to 5.00pm
Special Note: This course is not available for audit
Website: http://www.gi.alaska.edu/~mabra/index.php?slab=geos-422
Blackboard is used to post lecture materials

2. Instructor Information:

Matthias Braun / Robert Herrick
Office: Room 108D, WRRB, UAF
Telephone: 907-474-1522 / 6445
Email: mabra@gi.alaska.edu / rherrick@gi.alaska.edu
Office hours: ad hoc / by appointment
(Email is the best way to reach me)

3. Course readings/materials:

Course text book: The text book we follow in this course is “Remote Sensing and Image Interpretation, 6th Edition” by Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman”. The publisher is Wiley and the ISBN is 978-0-470-05245-7. The book is available at UAF book store and is also reserved at the Keith Mather Library, UAF. Former students succeeded in buying this text book at amazon, e-bay and other online sites at very modest prices. So feel free to check out before you buy. If you have a copy of the 4th or 5th edition of the text book, this will also work for the reading assignments (just that the page numbers are different; anything older than the 4th version is seriously outdated!). The newer version of the text book 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 blackboard.
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

You are encouraged to make extensive use of UAF's investment in electronic journals. Familiarize yourself on the use of Web of Science and the Goldmine database of the Rasmuson library. 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. This syllabus is tentative and might change during the class.

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 us know in advance and make arrangements for make up of the time. We do expect all students to abide by the UAF Student Code of Conduct (see: http://www.uaf.edu/catalog/current/academics/regs3.html)

9. Grading Policy:

Refer to the detail grading policy posted on the class web site.

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 thesis 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 us about it. We will work with you, and if required with the Office of Disabilities Services to provide all reasonable accommodation.