GGS 412 – Air Photography Interpretation – 15019 - 001

Syllabus

Instructor: Dr. Ron Resmini

Course description and objective: GGS 412, Air Photography Interpretation, will provide students with the concepts, principles, methods, and techniques of interpreting and using information contained in photographic and nonphotographic aerial imagery including applications to various aspects of physical and cultural landscape (e.g., agriculture and forestry, urban and industrial features, geology and landforms). This course examines the use of various types of electromagnetic energy to obtain spatial and compositional information from remotely sensed imagery of the earth. Course content will also emphasize: 1) photographic and nonphotographic airborne and spaceborne remote sensing concepts, systems, and sensors; and 2) strategies for visual extraction of features from remote sensing imagery. The objective of this course is to provide students with in-depth knowledge of the concepts, theories, principles, technologies, and methods of interpreting remotely sensed imagery of the earth. Topics covered include:

- *Introductory Concepts*
  - Energy Sources
  - Energy Interactions
  - Remotely Sensed Data/Imagery
  - Remote Sensing Systems
- *Photographic and Photogrammetric Principles*
  - Film-Based Imaging; Cameras
  - Filters
  - Electronic Imaging
  - Geometric Characteristics of Photographs
- *Image Analysis and Interpretation*
  - Fundamentals
  - Various Applications
- *Digital Image Processing: Summary & New Concepts*
  - Image Enhancement
  - Image Manipulation
  - Information extraction; Applications
- *Multispectral Remote Sensing/Thermal Imaging*
  - Physical principles
  - Algorithms
  - Information extraction; Applications
- *Hyperspectral Remote Sensing*
  - Physical principles
  - Algorithms
  - Information extraction; Applications

- *Remote Sensing Systems/Hardware; Airborne and Satellite*
  AVIRIS
  Landsat
  SPOT
  Other Earth Resource Sensors
- *Microwave and Lidar Sensing*
  Physical principles
  Systems and sensors
  Information extraction; Applications

Additional Information

- *Textbook:*
  Remote Sensing and Image Interpretation, 7th Edition, 2015,
  by Lillesand, Kiefer, and Chipman, John Wiley & Sons, publ.

- *Class meeting:*
  Monday, 4:30 p.m. to 7:10 p.m., in **Exploratory Hall 2312**

- *Office hours:*
  Monday, 3:30 p.m. to 4:30 p.m. or by appointment

- *Software:*
  ENVI® v5.3 (or v5.x) (I suggest you purchase a student license but you have access to this software in Exploratory Hall 2312. I'll say more about this at the first class meeting.)

- *Contact information:*
  Dr. Ron Resmini: rresmini@gmu.edu; v: 703-470-3022

- *Assignments:*
  Weekly

- *Exams:*
  One midterm exam (date: 14 Mar., 2016); in class, open book, open notes, etc.
  One comprehensive final exam (date: 9 May., 2016); in class, open book, open notes, etc.

- *Grading:*
  20% assignments, homework
  25% midterm exam
  25% final exam
  20% mini-project
  10% class participation

- *Grading Policy:*
  Grading in GGS 412 will follow university policy.

From the online GMU University Catalog:
http://catalog.gmu.edu/content.php?catoid=5&navoid=104
Scroll down to: 'Graduate Academic Standards, Grades' and see the following:

Undergraduate Academic Standards, Grades

"University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture or recitation, or not fewer than two hours per week of laboratory work, throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. The university-wide system for grading graduate courses is as follows:

Letter Grade	Quality Points	Status
A+	4.00	Passing
A	4.00	Passing
A-	3.67	Passing
B+	3.33	Passing
B	3.00	Passing
B-	2.67	Passing
C+	2.33	Passing
C	2.00	Passing
C-	1.67	Passing
D	1.00	Passing
F	0.00	Failing

For this course, letter grades are based on the following numerical score ranges:

Letter Grade	Percentage Points
A+	100.0 – 97.0
A	96.9 – 93.0
A-	92.9 – 90.0
B+	89.9 – 87.0
B	86.9 – 83.0
B-	82.9 – 80.0
C+	79.9 – 77.0
C	76.9 – 73.0
C-	72.9 – 70.0
D	69.9 – 60.0
F	≤ 59.9

- *Important websites:*

  USGS EarthExplorer: http://earthexplorer.usgs.gov/
  NASA RS Tutorial: http://www.fas.org/irp/imint/docs/rst/
  NASA Earth Observatory: http://www.earthobservatory.nasa.gov/
  NASA Earth Science Enterprise: http://www.earth.nasa.gov/
  NASA GSFC Landsat programs: http://landsat.gsfc.nasa.gov/
  USGS Landsat 7: http://landsat7.usgs.gov/
  EROS Data Center: http://edcwww.cr.usgs.gov
  ASPRS homepage: http://www.asprs.org/

- *Important journals (there are many others, too):*

  Remote Sensing of Environment (RSE)
  ASPRS Photogrammetric Engineering & Remote Sensing (PE&RS)
  IEEE Transactions on Geosciences and Remote Sensing (IEEE TGARS)
  International Journal of Remote Sensing (IJRS)

- *Other textbooks that are great remote sensing references (but* ***not*** *required):*

Adams, J.B., and Gillespie, A.R., (2006). Remote Sensing of Landscapes with Spectral Images: A Physical Modeling Approach. Cambridge University Press, 362 p.

Campbell, J.B., (2007). Introduction to Remote Sensing, 4th edition. The Guilford Press, New York, NY, 626 p.

Jensen, J.R., (2007). Remote Sensing of the Environment: An Earth Resource Perspective. 2nd edition. Prentice Hall Series in Geographic Information Science, Upper Saddle River, NJ, 608 p.

Jensen, J.R., (2005). Introductory Digital Image Processing. 3rd edition. Prentice Hall Series in Geographic Information Science, Upper Saddle River, NJ, 544 p.

Landgrebe, D.A., (2003). Signal Theory Methods in Multispectral Remote Sensing. Wiley-Interscience, John Wiley and Sons, New Jersey, 508 p.

Richards, J.A., and Jia, X., (1999). Remote Sensing Digital Image Analysis, An Introduction, 3rd, Revised and Enlarged Edition. Springer, Berlin, 363 p.

Sabins, F.F., (2007). Remote Sensing: Principles and Interpretation, 3rd Edition. Waveland Pr. Inc., 512 p.

Schott, J.R., (1997). Remote Sensing: The Image Chain Approach. Oxford University Press, New York, 394 p.

Schedule and textbook reading assignments ***(tentative; the schedule may change)****:*

Week	Date	Lecture Topic(s)	Lillesand et al. Chapter(s)
1	25-Jan-16	Intro. to course and intro. to remote sensing	1, Appendices
2	1-Feb-16	Physical principles of remote sensing	1
3	8-Feb-16	Physical principles of remote sensing	1, 2
4	15-Feb-16	Photographic Principles and Photogrammetry	2, 3
5	22-Feb-16	Image Analysis/Imagery Interpretation	7
6	29-Feb-16	Image Analysis/Imagery Interpretation	7
--	7-Mar-16	**Spring Break**	--
7	14-Mar-16	**Midterm Exam**	--
8	21-Mar-16	Exam Review	4
9	28-Mar-16	Thermal and Multispectral Remote Sensing	4
10	4-Apr-16	Thermal and Multispectral Remote Sensing	4
11	11-Apr-16	Hyperspectral Remote Sensing	sec. 5.13
12	18-Apr-16	Visual Image Interpretation and Application	8
13	25-Apr-16	Lidar Remote Sensing	6
14	2-May-16	SAR/Radar Remote Sensing	6
15	9-May-16	**Final Exam**	4:30 p.m. to 7:15 p.m.

See also: http://registrar.gmu.edu/calendars/spring-2016/

Academic Integrity/Honor Code: Students are expected to review and abide by the GMU Honor Code (http://oai.gmu.edu/the-mason-honor-code/).