**Syllabus**

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Email: lblesius@sfsu.edu  
Office hours: Tue 11-12/Th 2:30 – 4:30

**Course outline and objective:**
This course builds introduces advanced and/or specialized digital image processing (DIP) functions. This includes techniques necessary for using satellite images effectively in high energy environments, for example orthorectification and corrections for the topographic effect on radiometric values. In addition, more advanced classification techniques and methods to evaluate classification accuracy are introduced. These topics are accompanied by exercises in ERDAS Imagine that try to broaden the understanding of these functions. The second part of the class introduces a radically different concept in image processing, object-oriented image analysis, and introduces Definiens eCognition. This software will provide an alternative to the traditional pixel-based analysis, being useful particularly with high resolution satellite imagery and aerial photography. Upon completion of the course, students should understand and be able to apply physical processes in remote sensing, be able to complete DIP projects independently, be proficient in a major and widely used DIP software (ERDAS Imagine), and be able to use advanced object-oriented software (Definiens) in research projects.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Textbook(^a)</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 28</td>
<td>Introduction</td>
<td></td>
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<tr>
<td>2</td>
<td>Feb 2, 4</td>
<td>Physics of remote sensing</td>
<td>Ch. 1 (Schaepman-Strub et al. 2006)</td>
<td>Introduction to ENVI</td>
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<td></td>
<td></td>
<td>Emphasis on wave model</td>
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<tr>
<td>3</td>
<td>Feb 9, 11</td>
<td>Radar remote sensing</td>
<td>Ch. 2, 9.2 (Toutin and Gray 2000)</td>
<td>Exercise 1: DEM generation</td>
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<tr>
<td>4</td>
<td>Feb 16, 18</td>
<td>Lidar, Methods of digital elevation</td>
<td>Ch. 4.3, 9.4 (Toutin 2001)</td>
<td>Exercise 2: AtCor</td>
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<td></td>
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<td>model generation</td>
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<td>5</td>
<td>Feb 23, 25</td>
<td>Atmospheric corrections</td>
<td>Ch. 4.4 (Chrysoulakis et al. 2010)</td>
<td>Exercise 3: Adv. classification</td>
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<tr>
<td>6</td>
<td>Mar 1, 3</td>
<td>Advanced classification methods</td>
<td>Ch. 8 (Otukei and Blaschke 2010)</td>
<td>Exercise 4: Hyperspectral</td>
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<td>7</td>
<td>Mar 8, 10</td>
<td>Hyperspectral Image Analysis</td>
<td>Ch. 9.3 (Rosso et al. 2005)</td>
<td>Exercise 5: Minnaert correction</td>
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<td>8</td>
<td>Mar 15, 17</td>
<td>Radiometric and geometric</td>
<td>Ch 4.5 - 4.8 (Hantson and Chuvieco 2011)</td>
<td>Exercise 6: OBIA 1</td>
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<td></td>
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<td>techniques for mountainous areas</td>
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<tr>
<td>9</td>
<td></td>
<td>Spring break</td>
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<td>Midterm 1</td>
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<td>10</td>
<td>Mar 29</td>
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<td>Ex.4 cont.</td>
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<tr>
<td>11</td>
<td>Apr 5, 7</td>
<td>711 topic presentations</td>
<td>Ch. 7 (Benz et al. 2004)</td>
<td>Exercise 6: OBIA 1</td>
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<tr>
<td>12</td>
<td>Apr 12, 14</td>
<td>Object-oriented image analysis and</td>
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<td>Exercise 7: OBIA 2</td>
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<td></td>
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<td>image segmentation techniques</td>
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<td><strong>Midterm2</strong></td>
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<tr>
<td>13</td>
<td>Apr 19, 21</td>
<td>OBIA</td>
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<td>14</td>
<td>Apr 26, 28</td>
<td>OBIA</td>
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<td>15</td>
<td>May 3, 5</td>
<td>Project work</td>
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<td>16</td>
<td>May 10, 12</td>
<td>Project work</td>
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<td>17</td>
<td>May 17, 24 1:30-4</td>
<td>Project presentations</td>
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Evaluation:

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Exercises</td>
<td>7*4% = 28%</td>
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<tr>
<td>Project (paper, presentation)</td>
<td>30%</td>
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<tr>
<td>Midterm 1</td>
<td>15%</td>
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<tr>
<td>Midterm 2 (take home)</td>
<td>15%</td>
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<tr>
<td>Short lecture</td>
<td>7%</td>
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<tr>
<td>Field trip/workshop (TBA)</td>
<td>5%</td>
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Grades (+/- will be used):

- A: 90 – 100%
- B: 75 – 89.99%
- C: 60 – 74.99%
- D: 50 – 59.99%
- F: <50%

Methods of instruction, Exams and assignments

Tuesdays will be lectures, Thursdays is reserved for exercises. Exercises are due one week after they have been assigned. Exercises hand-ins must include a written evaluation of the technique introduced in the exercise. For some exercises graduate students may be paired with undergraduate students to provide guidance. Students will give a short (30-45 min) lecture on an assigned topic to the class. Midterm 2 is a take-home exam. It is a 5 page research proposal for your final project, in which you indicate your question, identify literature pertaining to the question, and outline your remote sensing methodology to answer the question. Final project paper is then a 15 page report. The report should include figures and must include a substantial literature review pertaining to the final project. Participation in 2 of 3 one day field trips (Saturday or Sunday) is expected.

Additional literature:


Textbooks (general)

Textbooks (specialized)

Journals
Annual Review of Earth and Planetary Science
Canadian Remote Sensing Journal
Computers and Geosciences
Computers and Geotechnics
Geoinformatica
International Journal of Geographical Information Systems
International Journal of Remote Sensing
ISPRS Journal of Photogrammetry and Remote Sensing
Physics and Chemistry of the Earth, Part C, Terrestrial and Planetary Science
Photogrammetric Engineering & Remote Sensing
Remote Sensing (open journal)
Remote Sensing of Environment

STUDENTS WITH DISABILITIES who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) will facilitate the accommodation process for individuals with verified disabilities. If a student is a DPRC client, he/she must present an RAV (Reasonable Accommodation Verification) AND an EAR (Exam Accommodation Request) to the instructor at the beginning of the semester. Students are responsible for submitting the completed EAR form to the DPRC. Any changes to the accommodation require prior approval by a DPRC specialist. Changes cannot be requested during an exam. The DPRC is located in the SSB-110 and can be reached by telephone (voice/TTY 415-338-2472) or by email (dprc@sfsu.edu).

STUDENT DISCLOSURES OF SEXUAL VIOLENCE. SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact: The SAFE Place - (415) 338-2208; http://www.sfsu.edu/~safe_plc/
Counseling and Psychological Services Center - (415) 338-2208; http://psyservs.sfsu.edu/
For more information on your rights and available resources: http://titleix.sfsu.edu

PLAGIARISM OR CHEATING is always rewarded with an F. Details about plagiarism at SFSU can be found at: http://online.sfsu.edu/~rone/StudentHelp/Plagiarism.html. All submitted work should be that of the student whose name appears on the work.

COURSE INTERNET RESOURCES: The course iLearn site is a critical resource for this class. You will need regular (at least weekly) access to a computer and internet for course updates, online quizzes and access to all course materials. Computer labs on campus: <http://www.sfsu.edu/~doit/labs.htm>

CLASSROOM PARTICIPATION: In-class hours are MANDATORY and class begins ON TIME. Consistent absence is always reflected in final grades. Classroom behavior is common sense: out of respect for the learning environment, please turn off all cell phones, beepers etc, keep classroom discussion to the topic and show respect and tolerance to your fellow students at all times.

DEADLINES:
Student DROP/AUDIT/ADD deadline 9 February (T)
Last ADD (by exception) deadline 28 February (T)
CR/NC deadline 20 March (Su)
Do not select CR/NC if a course is required for your major. CR/NC petitions after Mar. 20 seldom granted.
Retroactive petitions (CR/NC to letter or vice versa) not permitted.
Withdrawal for “serious & compelling reasons” 10 February (W) – 28 April (Th)
Withdrawal (by exception) (Serious & compelling; documentation required) 29 April (F) – 17 May (T)
NO WITHDRAWALS permitted after May 17.